# Society Reports.

## AMERICAN ELECTROTHERAPEUTIC ASSOCIATION.

*Thirteenth Annual Meeting, Held in Atlantic City, N. J., September 22, 23, and 24, 1903.*

DANIEL R. BROWER, M.D., OF CHICAGO, PRESIDENT.

**Special Report to the Medical Record.**

*Tuesday, September 22—First Day.*

THE association was called to order in the Hotel Windsor. Although there was a goodly number in attendance, a tinge of sadness was noticeable in the proceedings because there was a feeling of personal loss in the death of their genial and indefatigable coworker, Dr. Robert Newman, of New York, who was called away while busily engaged in making the final arrangements for the meeting. It need hardly be said that the resolutions relative to this event represented more than a mere formality.

**President's Address.**—Dr. DANIEL R. BROWER of Chicago, in considering the welfare of the association, made the suggestion that it should unite with the American Medical Association or become one of the component societies of the Congress of American Physicians and Surgeons. Such a step would offer an excellent opportunity for interesting the general practitioner in electrotherapeutics.

**New Electrodes.**—Dr. FRANCIS B. BISHOP of Washington, D. C., described an electrode, for the static or high-frequency currents, which was made up of a bottle filled with water and having a piece of wire passed down into the liquid as a conductor. He had also constructed a useful electrode from a child's whisk broom. A long wooden handle was attached to the broom, and provided with a sliding brass collar. It gave a very soft and diffused current with the static spray.

Dr. MORRIS W. BRINKMANN of New York had devised a series of electrodes made of glass tubes, both straight and curved, which were filled with plumbago or crushed electric-light carbon. He also used electrodes made of glass tubes having very thick walls and a very small caliber. These were filled with mercury.

Dr. WILLIAM B. SNOW of New York expressed a preference for electrodes of white maple wood tipped with pieces of various shapes. He also employed a series of vacuum tubes of various sizes and shapes suitable for use not only on the surface of the body but in its various cavities.

Dr. G. BETTON MASSEY of Philadelphia exhibited some platinum-iridium needles which he made out of platinum-iridium wire obtained from dental supply houses. Pieces of suitable length were sharpened at one end by a jeweler's file, and fastened into a handle of hard rubber, being connected with No. 30 conducting wire. They might be very delicately insulated by heating them and melting on hard rubber from a piece half an inch thick. Although this insulation did not last more than half an hour, it could be so readily and finely applied that it was of much value.

**An Experiment in Cataphoresis.**—Dr. FRANCIS B. BISHOP of Washington, D. C., described some experiments that he had made, and which he believed demonstrated that the high-frequency current, as transmitted through a transformer, would penetrate glass and transmit through the glass metallic and liquid substances. He made use of a Piffard coil excited by a Toepler machine of twelve revolving plates. A solution of starch was placed between two clean glass plates measuring 8 by 10 inches, and a sealing of paper, fastened with starch paste, was then applied to the glass plates. A solution of potassium iodide in glycerin was placed on the center of the upper glass plate, and the lower glass plate was placed upon a metallic surface and connected with the earth. The spark employed came from one side of the Piffard coil, and was directed upon the iodide solution. In a few minutes iodide of starch was formed. In order to see if the process could be reversed, Dr. Bishop began treating some joint cases by applying iodide of potassium solution externally and applying the high-frequency current by means of his hollow glass electrode, filling the latter with a solution of starch. After having used this electrode for several weeks small specks of iodide of starch could be seen floating in the fluid.

Dr. T. A. PEASE of Norwood, N. Y., said that he had been able to confirm the last observation described.

Mr. R. G. BROWN thought Dr. Bishop had been misled, and that the result would have been different if the two glass plates had been hermetically sealed.

Dr. W. B. SNOW remarked that workers with vacuum tubes knew well that the current passed through the glass.

Dr. ALBERT C. GEYSER of New York was disposed to think that the blue reaction obtained was not due to iodide of starch but to the action of the ozone generated.

**Committee on Constant Current Generators and Controllers.**—Dr. WILLIAM J. HERDMAN of Ann Arbor, Mich., presented this report. He said that the constant current was now obtained for electrotherapeutic work from industrial dynamo currents all over the world, and was used with much satisfaction; but in some places there was no such dynamo current available, and, moreover, it was not portable, and, hence, could not be used at the bedside. The dry cell had partially solved this problem. The investigations of the committee showed that the constancy and efficiency of the dry cells found upon the market differed very considerably. The drain upon their chemical composition was not heavy, but it was intermittent and irregular, the demand being considerable at times, followed by more or less prolonged intervals of rest. For three years they had experimented with such cells in the laboratory, simulating as closely as possible the actual conditions found in medical practice. Some of the results of these tests had already been submitted to the association, and the present report showed the results obtained with a new and very promising candidate for favor among the dry cells on the market.

**Electrotherapy as a Specialty.**—Dr. ALFRED W. BAYLISS of Buffalo presented this paper. He dwelt upon the need for special preparation and compared the work done here and in the hospitals abroad. The author advised the exercise of caution in giving a prognosis until the effect of the current had been studied in the individual case.

Drs. A. D. ROCKWELL and W. B. SNOW of New York objected to making electrotherapeutics a specialty.

**The Effects of the Secondary Static Currents in Removing Albumin and Casts from the Urine.**—Dr. BOARDMAN REED of Philadelphia was the author of this paper. He said that probably one-fourth of his cases of gastrointestinal disease of long standing had had hyaline casts and albumin in the urine; nevertheless, many of them had proved amenable to appropriate dietetic and other treatment. These cases probably belonged in the category of toxic nephritis, and resulted from the injurious action of the toxins of indigestion upon the kidneys. He proposed to call such cases autotoxic nephritis, and was of the opinion that if they were neglected or were wrongly treated they might lead to permanent organic disease of the kidney. His experience in the treatment of these cases had not been satisfactory until he had resorted to the use of static electricity, as suggested by Dr. A. D. Rockwell. During the past year he had observed eighteen cases of this kind. Four illustrative cases were reported, in three of which static electricity successfully controlled the albuminuria. So far as his experience had gone, the faradic current had not proved so useful in these cases as the static current. In most cases he had made use of the static wave current, but he was inclined to think now that the static induced current was the best form of electricity to employ in this class of cases. He had had urine analyses made just before and after many of the treatments, and had found a decided increase in the excretion of the urea after the electrical treatment, showing that there was a definite physical action, and that this treatment was something more than psychical.

Dr. A. D. Rockwell of New York said that he believed that by exciting circulatory drainage much could be done in the way of relieving inflammatory action in the tubules and stroma of the kidney, a condition often spoken of as Bright's disease. There seemed to be, however, no sharp line of demarcation between inflammatory and structural disease of the kidney. Electricity was certainly an agent for reducing congestion and increasing the blood-pressure in the glomeruli of the kidney, and in this way it improved the nutrition of that organ and, theoretically at least, freed the glomeruli from the products of inflammation. He would, in this connection, caution against too great optimism in the treatment of such cases, for it had taken him five years to secure five cases which, in his opinion, were suitable for electrical treatment. All such cases had been treated for periods of from three to eighteen months, and he had taken the precaution to have the accuracy of the clinical records vouched for by medical colleagues. He firmly believed that the method of treatment under discussion was of value in the milder forms of kidney disease.

Dr. William Benham Snow of New York expressed his surprise that Dr. Reed should prefer the static induced to the wave current, and was disposed to believe that this was because Dr. Reed had not used a sufficiently great spark gap. Personally, he believed that the wave current would give more uniformly good results than the static induced, because the latter was more local in its action, and produced less nutritional effect. In treating the back with this current he employed a spark gap of from 4 to 6 inches, and in obese persons a gap of even 8 inches.

Dr. G. Betton Massey of Philadelphia said that some years ago he had treated by static electricity a person whose urine contained a considerable quantity of sugar. The treatment had been persisted in for several months, and urinary examinations had been made from time to time. Although the effect of the treatment on the quantity of sugar was very favorable, the treatment was finally discontinued because it was evident that a cure could not be effected.

Dr. Reed, in closing the discussion, said that it was possible that if he had used a more powerful static machine he would have secured better results from the wave current. He wished it distinctly understood that he did not claim that any of his cases had been cured, but simply that after treatment for from one to three months the urine became free from albumin and casts, and that this apparent cure had lasted so long as these persons had observed a proper mode of life.

**Some Principles upon Which Is Based the Use of Electricity in Nervous Diseases.**—Dr. A. D. Rockwell of New York presented in this paper some theoretical considerations concerning the manner in which electricity acts upon the neurons, and discussed the possible identity of electricity and nerve force.

**X-ray and Light in the Treatment of Tuberculosis.**—Dr. Russell Herbert Boggs of Pittsburg read this paper. He declared that these therapeutic methods should be placed first among the adjuvant measures in the treatment of this intractable disease, and that, too, without regard to its location. The author objected to the static machine as a source of the *x*-ray because of its uncertainty and lack of volume. Personally, he made use of a medium low tube excited by sufficient current to penetrate the chest. There was great difficulty in selecting the proper tube, and, at the present time, it seemed to be necessary to keep ten or more tubes on hand having special individual qualities. All tubes did not work equally well when used with the same spark gap. Of course, medicinal, dietetic and other acknowledged methods of treatment of tuberculosis should be employed in addition to the light therapy. In giving the latter, it was his custom to give an exposure of ten minutes on alternate days.

Dr. Charles R. Dickson of Toronto queried whether Dr. Boggs had made any use of the static machine, because he personally believed that his own results with this machine had been fairly good.

Dr. W. B. Snow said that if the static machine were used in such a way as to obtain a sufficient volume of *x*-rays the results with it would equal in every respect those obtained with the coil. He would also take exception to the author's statement that the fluoroscope was a better index of the quality of the *x*-ray tube than the spark gap. One could take a very low vacuum tube in which there was no fluorescence whatever, and excite it so as to produce a radiance which would show a picture of the bones of the hand upon the fluoroscope in white, just as with a high vacuum tube. This showed the fallaciousness of the fluoroscopic test. He personally believed that practically the same results could be obtained from both classes of apparatus.

Dr. Robert Reyburn of Washington, D. C., said that as there could be no question that some of these cases were cured by the *x*-ray it became an interesting question how such an agency could cure. He had come to the conclusion that both in tuberculosis and in cancer the *x*-ray surrounded the morbid cells with an inflammatory product, thus preventing systemic infection. Moreover, the *x*-ray increased the nutrition of the part, so that when aided by proper diet and hygiene this agency was able to overcome the tubercle bacillus and produce a cure.

Dr. T. A. Pease of Norwood, N. Y., spoke of a case of extensive tuberculous involvement of the glands of the neck that he had cured by static electricity.

Dr. Francis B. Bishop thought the essayist was, in the main, correct in the statement that the coil as a rule yielded better results. To obtain as good results with the static machine as with the coil the machine must be run at a very high speed, the machine itself must be very powerful and a high vacuum tube must be employed. However, for superficial growths the static machine gave as good, if not better, results because there was less liability of burning the patient and less liability of breaking the tubes. One could not get the same volume of current through the tubes with the static machine as with the coil. He had usually obtained better results from the Toepler than from the Holtz machine. The treatment of tuberculosis by the *x*-ray opened up a promising field for research. He was satisfied that he had just succeeded in curing three cases of tuberculosis by means of a convective discharge from "a cage" directed upon the shoulders and chest. No less an authority than Dr. E. L. Trudeau was authority for the statement that the left apex of the lung, in one of these patients, which had been the seat of an active tuberculous process at the time of coming under treatment, had healed. Although he was ignorant of the method by which the *x*-ray accomplished these cures, he could not accept Dr. Reyburn's theory, because if these cases were exposed too long at first to the *x*-ray there was great danger of producing a general systemic infection, thus disprovng the theory of the formation of a protecting wall.

Dr. A. D. Rockwell thought that if vario-vacuum tubes were employed it would be found to be immaterial whether a static machine or a coil was used.

Dr. George Z. Goodell of Salem, Mass., remarked that he had been treating tuberculous cervical lymph nodes for the past three months in a young girl of tuberculous family history, employing a tube excited by a Kinraide coil and a spark gap of three inches, but had observed no diminution in the size of the affected nodes.

Dr. Willis P. Spring of Minneapolis inferred from the superiority of the coil in connection with *x*-ray photography that it was better than the static machine in ordinary therapeutic work, and instanced a case of suspected fracture of a metacarpal bone in which the radiograph made with the aid of the static machine hardly showed any metacarpal bone, whereas the radiograph taken with the help of the coil, under precisely the same onditions as to exposure and development, showed the metacarpal bone very distinctly.

Dr. Boggs, in closing, said that he had not intended any one to infer from his statements that he believed it was impossible to do good work with the static machine in connection with the use of *x*-ray treatment, but only that with the static machine the treatment was far more difficult than with the coil and the dosage was more uncertain. In many of his cases the distressing cough had been quickly relieved for a period of several hours by the light treatment.

**Currents of High Frequency, Apparatus and Therapeutic Uses.**—Dr. Francis G. DuBose of Selma, Ala., sent a paper with this title, which, in his absence, was read by Dr. Massey. He described at length an apparatus used abroad, by which a current of unusually high frequency—several million oscillations per second—was obtained. The nerves were unable to convey the sensations produced by such rapid vibrations, and consequently a current of over 400 milliamperes could be passed without causing pain. The current from this apparatus had been found of very general therapeutic utility, and especially valuable in obstinate cases of chronic rheumatism and of joint enlargement. As a tonic in various depraved conditions it acted more rapidly than did drugs. Post-operative pelvic pain and various congestive conditions of the pelvis were very amenable to this current. In minor surgery it would, in most cases, replace cocaine or the infiltration method for the production of local anæsthesia. The writer has made use of this apparatus for over a year, and was of the opinion that it was the most useful of all electrotherapeutic apparatus. Some difficulty had been experienced in adapting this foreign apparatus to the commercial currents employed in this country.

Dr. A. D. Rockwell took exception to the author's statement regarding the amperage or magnitude of these currents, being of the opinion that in the step-up process magnitude was lost. The current described was probably not more than 3 or 5 milliamperes. He had had some experience with the high frequency or D'Arsonval current, and had come to the conclusion that there was no effect on the general nutrition from the hypostatic current, and that almost its only use was in the treatment of superficial diseases of the skin.

Dr. Francis B. Bishop said that a few weeks ago he had seen, in Dr. H. G. Piffard's office, a 16-candle power lamp brought to full incandescence through a D'Arsonval coil. He had used the high-frequency current with good effect in the treatment of enlarged joints in rheumatoid arthritis, and also in various forms of neuritis, and believed it was going to be more generally used than any other current in electrotherapeutics.

**Electricity in the Treatment of Chronic Deafness.**—Dr. George Z. Goodell of Salem, Mass., read this paper, which was based upon replies to a circular letter and on a study of the literature rather than upon any extensive personal experience with this method. The cases treated were non-suppurative; they were examples of chronic catarrhal otitis media. Several observers had spoken of relieving the tinnitus by a mild interrupted current, but none of them reported cures. It made no difference which pole was applied to the ear. Better results were obtained from the continuous current, the positive pole being applied to the ear through the medium of sterile water in the ear. Static electricity had been but little used in this field. Electrolysis of the Eustachian tube had been quite extensively employed recently, a method of which Dr. Arthur B. Duel and the late Dr. Robert Newman were strenuous advocates. However, many aurists were of the opinion that the results were no better than from ordinary dilatation of the Eustachian tube.

**Clinical Report on the Use of the X-ray in Lesions of the Spinal Cord.**—Dr. Charles W. Daniels of Savannah, Ga., was the author of this paper, which, in his absence, was read by Dr. Snow. Two cases of tabes were reported in which very great improvement was effected, although the associated pains could not be entirely removed. This suggested the possibility of employing this method of treatment in degenerative diseases of the spinal cord in the hope of improving impaired functions and preventing a further extension of the disease process. Two cases of arthritis deformans were now under treatment, and appeared to be improving. The author disclaimed any intention of asserting that this method of treatment would effect a cure in any case of tabes, although insisting upon its probable value in controlling degenerative lesions.

**Employment of Static Electricity in the Treatment of Nervous Diseases.**—Dr. William Benham Snow of New York presented this paper. He said that the treatment of diseases of the nervous system consisted largely in the relief of inflammatory conditions and the improvement of nutrition. An electrical current for improving nutrition should have a high potential, great penetration, and a small current flow. These conditions, in his opinion, were best met by the wave current. Such an application produced contraction of muscular tissue, polarization and electrolysis. There were very few nervous diseases that were not associated more or less with inflammatory processes. In acute neuritis it was his custom to apply at first as long a spark as possible, gradually increasing it for twenty minutes; then sparks were applied to the same region along the course of the affected nerve. In chronic cases sparks were the main reliance, and should be applied chiefly to the seat of the neuritis, that is, to the region in which the sparks cause the most pain. A great triumph in electrotherapeutics was the electrical treatment of anterior poliomyelitis. Excellent results were obtained in the very early stages, a soft metal electrode being applied to the spinal cord and the wave current with an extremely long spark gap. A number of cases of neurasthenia successfully treated by the wave current were reported.

Dr. R. J. Nunn of Savannah, Ga., said that radium exhibited the highest known vibration of what we might call the ether, and it was just such vibrations that we desired for treatment. The higher the vibration the greater the curative property. He believed that all electrical currents presented vibrations, and that the lower vibrations served simply as diluents of the higher ones. The lower vibrations burned the tissues; the higher vibrations penetrated them. These papers brought out very clearly the fact that the higher vibration was the curative element, and that the better we could learn to use this agent or dilute it to suit particular cases, the better would be the result.

Dr. T. A. Pease also believed that the chief curative action of electricity depended upon vibration. With his static machine of six revolving plates and a transformer made out of watch springs in a glass tube he was able to double the usual output of the high frequency current, and could make vacuum tubes glow in any part of his office without contact with the patient.

Dr. Charles O. Files of Portland, Me., said that for many years the only explanation he had been able to give himself for the relief obtained through the agency of electricity was that it relieved congestion. Electricity, for example, hastened the circulation through the capillaries in which there was more or less stasis, and so tended to relieve insomnia. Every form of congestion seemed to be relieved by electricity, but the applications must be frequently repeated in order to secure a permanently good result. This theory certainly formed a good working hypothesis, and, in his opinion, was in accordance with the observed facts.

Dr. J. R. Stuart of Minneapolis also spoke briefly of the great power of the high-frequency current to relieve pain and reduce congestion.

**A Year's Work in Electrotherapy.**—Dr. Laura Viola Gustin-Mackie of Attleboro, Mass., presented this paper, based upon a clinical experience with 125 cases. Many of these had been referred to her as a last resort after general practitioners had become wearied with their futile efforts to bring about some improvement. Young, anæmic women suffering from ovarian pain, leucorrhœa and other conditions arising from local pelvic disturbance, in whom pelvic examination was undesirable, could often be relieved by electrical treatment. In the treatment of uterine fibroids she had not made use of the very high currents. She had observed very little benefit in the treatment of arthritis deformans.

Dr. Marcus M. Johnson of Hartford said that, like the author, his experience had been almost uniformly favorable with regard to the relief afforded by static electricity in the same class of cases. Mention was made of a severe case of exophthalmic goiter which had been rapidly and successfully treated in this way, that is, as regards the nervous symptoms.

**Electrical Treatment of Trachoma and Corneal Opacity, with Illustrative Cases.**—Dr. Margaret A. Cleaves of New York presented a paper with this title. In it she detailed the history of a very severe and long standing case of trachoma. She made thirty-seven electrical applications during three months and a half, using a zinc electrode and 2½ milliamperes of current for two minutes, with an indifferent electrode, 11 square inches in area, placed at the nape of the neck. There was a steady gain. In ten days it was noticed that nearly all of the sago bodies had disappeared and the circulation had been materially improved. About six weeks after coming under care the patient could count fingers, whereas at the beginning he had been utterly unable to do this. The applications were made three times a week, which was oftener than she was accustomed to give such applications in the other cavities of the body. This was because of the partial neutralizing action of the tears. The patient completely recovered from his trachoma. He was discharged in June, 1896, and on October 13 of the same year there was no sign of the trachoma, a fact which was substantiated by Dr. William Oliver Moore. An attempt was then made to treat the corneal opacity by cathodal electrolysis, using one milliampere for from one to three minutes, three times a week. This was always followed by the mechanical action of the induced current. In six months he had recovered fully two-thirds. The boy had originally been an object of charity, and the treatment had made him a useful member of the community and had prevented him from becoming a public charge.

**The Successful Treatment of Eighteen Cases of Granular Lids by the X-ray and High Frequency Vacuum Electrodes.**—Dr. Albert C. Geyser of New York read this paper. The $x$-ray was used for the specific purpose of checking the granular hypertrophy. In carrying out this method the tube must not be brought nearer than 6 or 8 inches. Exposures of from three to five minutes were given on alternate days for two or three weeks, and then the high-frequency current was employed to improve nutrition. The eyelids were everted by attaching a strip of adhesive plaster and a weight, and placing a lead pencil underneath the lid to facilitate the eversion. The surrounding parts were protected by a shield.

*Wednesday, September 23—Second Day.*

**Exophthalmic Goiter and Its Rational Treatment.**—Dr. Francis B. Bishop of Washington, D. C., read this paper. The author took the ground that Graves' disease was superinduced by the early and continued use of the corset, and that anæmia, through faulty metabolism, often acted as a predisposing cause. In the management of such cases rest was an important factor. These persons should go to bed early and get up late. All pressure should be removed from the chest and abdomen, and deep breathing exercises should be enjoined. As to the diet, nitrogenous food was of the first importance, and although they would not gain flesh on this diet, the nutrition of the muscular and nervous systems would be materially improved. After years of medication the conclusion had been forced upon him that it was of little use. Owing to the low resisting power of these patients they should not be subjected to anæsthesia or operation unnecessarily. Many authorities agreed that the best results from treatment in this disease had been obtained by the proper employment of electricity. We knew that the vagus was easily stimulated in the neck, and that this could be done much more easily than stimulation of the sympathetic. By the stimulation of the vagus the heart's action would be slowed and steadied. The speaker preferred to apply the continuous current, stimulating both nerves at the same time. A large sponge electrode attached to the positive pole should be placed high up on the neck, and a bifurcated cord with two sponge electrodes placed on each side of the lower part of the neck over the pneumogastric nerves and impinging upon the thyroids. A current, the strength of which was increased up to the point of toleration, should be allowed to pass for ten or fifteen minutes, or until a decidedly quieting effect was produced, and then the current should be applied directly to the gland for about the same length of time. The applications should be made on alternate days. Recent experience in the treatment of these cases by the high frequency current had yielded very satisfactory results. He was convinced that much good came from what Dr. Rockwell called "circulatory drainage." The current strength was regulated in these cases by the effect upon the pulse.

Dr. G. Betton Massey spoke of the recently published views of Sajous concerning the functions of the thyroid and their relation to the functions of the adrenals and the pituitary bodies.

Dr. T. A. Pease of Norwood, N. Y., said that during the past two years he had developed a method of treating exophthalmic goiter which he could recommend. A 4-per-cent. solution of adrenalin was applied to the gland by means of a copper disk electrode, and the continuous current was passed until the skin was thoroughly blanched. The high frequency current was then applied through a modification of Dr. Snow's wooden electrode. This gave better results than any other method of treating exophthalmic goiter.

Dr. A. D. Rockwell believed that treatment of this disease by the galvanic current was superior to all other methods. About a dozen years ago he had published an analysis of about forty cases of exophthalmic goiter, twelve of which had been cured. Since that time almost every case had shown improvement, and a large number had been cured, largely as a result of the thoroughness of the treatment. He made use of a very moist and pliable clay electrode, 2 or 3 inches in diameter, applied over the ciliospinal center, and an electrode, 4 or 5 inches in diameter, over the solar plexus. With electrodes of this size and material his advice was not to be afraid of using too much current strength; with the arrangement just described he frequently employed a current of 75 milliamperes.

Dr. W. W. Eaton of Danvers, Mass., said that he could confirm what Dr. Rockwell had said concerning the great efficacy of galvanic treatment in these cases, as he could recall only one case in ten years that had not been symptomatically cured along with the disappearance of the enlargement of the gland. He molded a clay electrode to the growth, and employed at least a current of 30 or 40 milliamperes, often very much more.

Dr. Bishop, in closing, said that he, too, had found the continuous current of the greatest benefit, but recently he had done still better with the high-frequency current as an auxiliary. He never used clay electrodes, preferring those made of sponge and having a tin foil backing. The electrode on the back should not be so large as to divert too much of the current from the thyroid. The patient should be in the reclining position, and the current should be very gradually increased, watching the effect on the pulse. He had occasionally used currents of 50 or 60 milliamperes, but had not found that such strong ones were often desirable.

**Effect of the X-ray upon the Eyesight.**—Dr. Willis P. Spring of Minneapolis asked for experience regarding the effect of using the fluoroscope on the eyesight of the operator.

Dr. W. J. Herdman of Ann Arbor remarked that Mr. Rollins of Boston declared that there was a uniform deterioration of the eyesight from the use of the *x*-ray.

Dr. C. R. Dickson of Toronto remarked that one of the absent members of the association had had his eyesight almost ruined in this way.

Dr. Loring of Boston said that a very simple means of protecting the eyes was to attach a thick piece of glass behind the fluoroscopic screen. He could recommend this from personal experience.

Dr. R. J. Nunn advised that the glass used as such protection should in all cases be tested to determine if it were really opaque to the *x*-ray.

**Zinc-mercuric Cataphoresis of Tuberculous Glands.**—Dr. G. Betton Massey of Philadelphia gave a practical demonstration of this method. A sliver of zinc, sharpened at one end, is used for the active electrode. If the gland to be treated is unopened, the sliver of zinc should be uninsulated at first, and should not be dipped into the mercury until just before use, otherwise it would become too brittle. The point of introduction is chilled with an ethyl chloride spray and the puncture is made with a Hagedorn needle. Immediately afterward the zinc electrode should be inserted, and then a current of ½ to 3 milliamperes used for half an hour. A drop of a saturated solution of cocaine may be dropped in along side of the electrode. A cylinder of necrosed tissue comes away within a few days, and the treatment is repeated through this opening, using now an insulated zinc electrode, *i. e.* another sliver of zinc prepared as before. The gland becomes so impregnated with mercury that it drains downward and favorably affects other glands in the chain. The active agency in the treatment is the chloride of mercury and zinc. In addition to this, Dr. Massey said there was a marked general improvement in these patients, although no other method of treatment was employed at the time. He had used the method in six cases. A little girl was shown who had been treated for about three months, three times a week.

Dr. Robert Reyburn spoke against the use of the knife in these cases, as in cases of malignant disease, on the ground that surgical operation laid open so many channels for absorption and further infection.

Dr. M. A. Cleaves said that about five years ago she had successfully treated one case of tubercular adenitis by the same method, using, however, copper instead of zinc as the electrode.

**A Plea for Electrotherapeutics Proper.**—Dr. William J. Herdman of Ann Arbor, Mich., presented under this caption a thoughtful paper in which he decried what he called the recent tendency of the association to run after fads and fancies and "sell its birthright for a mess of pottage." He deprecated the disposition of the members to forsake the true electrical modalities, to foster whose special used the association had been organized, and to spend much time and energy in border-line studies. The author then reviewed in a simple and forceful manner the evidence showing the manifold and important therapeutic properties of these modalities. He declared that the therapeutic actions of the constant current, about which too little was heard in these latter days, was alone worth more than half of the drugs listed in the pharmacopœia or the instruments employed by the surgeon. As a case in point the speaker referred to an osteosarcoma of the jaw which he had successfully treated by electrolysis, making six applications at intervals of a week. The patient had practically no suffering, he lost no time from business, there was no impairment of deglutition or loss of symmetry of the face. This was but one of several similar cases, the evidence regarding which was in his possession, and he, therefore, asked his hearers whether they could honestly say that there was any other method that could accomplish so much.

Dr. Marcus M. Johnson said that as he was a surgeon he could thoroughly appreciate the remarkable success of Dr. Herdman in the reported case of osteosarcoma of the jaw. Although it could not be said that the disease would not recur, it was a fact that the patient had not been subjected to torment nor his life jeopardized in the attempt to eradicate the disease. While surgery was doing a great work in many lines, yet in certain directions it had its limitations, and this was one of them. He therefore welcomed all the aid that could be derived from electricity.

Dr. F. B. Bishop said that at the Buffalo meeting almost every one was speaking of the static current, and the old constant or direct current seemed to be almost forgotten. He thought there was a slight difference between the static current and the high-frequency current, especially in the use of the spark. The spark of the high-frequency current was very much more penetrating and was, at the same time, less painful.

Dr. W. B. Snow said that the members were physicians, first, rather than electrotherapeutists, and it should be their earnest wish to do the best possible for their patients. They should, therefore, be able not only to use electricity, but any other physical agent, *e. g.* other forms of vibration, such as heat and light.

**Radiant Light Baths in the Treatment of Neuroses.**—Dr. Thomas D. Crothers of Hartford read this paper. The author stated that another year's experience with this method had led him to think even more highly of it than in his former paper, and the patients who took both the Turkish bath and the radiant light bath uniformly preferred the latter, because of the great exhilaration during the bath, and the greater feeling of restfulness afterward. Observations on the pulse and temperature also seemed to point to the superiority of the light bath. The marked sudorific action of these baths resulted in a free elimination of toxins, and appeared to be largely instrumental in restoring the patients to health. The radiant light, penetrating the deeper tissues of the body, was thought to be turned into heat, thus achieving greater therapeutic results than the ordinary hot-air bath.

Dr. M. A. Cleaves said that for the past ten years she had been interested in this subject, but her experience had been chiefly with the arc light. She thought the incandescent light bath was better for the special class of cases considered in the paper.

**A Case of Asthma with Fibroids and Pelvic Adhesions Cured by Galvanism.**—Dr. Charles A. Covell of Syracuse reported this case. The asthma was of reflex origin, and ceased as the pelvic condition was relieved. The patient was cured by the electrical treatment, although a well-known gynecologist had declared that she could not be relieved except by the removal of the diseased pelvic organs.

Dr. Gustin-Mackie remarked that at one time when treating the uterus for the control of hemorrhages arising from the presence of a small interestitial fibroid, she was surprised to find the patient's asthma relieved coincidentally with the pelvic condition.

**The Use of the X-ray in the Treatment of Malignant Growths.**—Dr. Marcus M. Johnson of Hartford reported in this paper cases to illustrate the superiority of this method in certain cases over surgical operation.

**Radium, with a Preliminary Note as to Its Therapeutic Uses in Cancer.**—Dr. Margaret A. Cleaves of New York read this paper, which will appear in an early issue of the Medical Record.

**The Present Status of X-ray Therapy in the Management of Cancer.**—Dr. Clarence E. Skinner of New Haven read this paper. He said that it was impossible to formulate a positive verdict regarding *x*-ray therapy because of the careless and unskilful methods that had been employed by many who had reported cases treated by this agency. However, the *x*-ray might be said to be one of the best, if not the best, means at present at our command for the treatment of malignant disease, because as large a proportion of cures had been obtained by this method as by any other, and a smaller proportion of recurrences had been noted within a given period. Moreover, the majority of the recurrences had yielded readily to another application of the *x*-ray. In the early stages it was now thought best, when practicable, to resort to thorough removal by surgical operation, following this by a thorough course of treatment by the *x*-ray. There was almost unanimous agreement as to the advisability of using the *x*-ray following all operations for cancer in order to prevent recurrence and to relieve pain. He knew of but one operator who claimed to have effected a cure in cancer of bone by means of the *x*-ray. As to whether *x*-ray hastened metastasis was still *sub judice*, yet the evidence seemed to favor the view that it did not have such action. His personal belief was that there was a therapeutic difference between the action of the *x*-ray as obtained from the coil and from the static machine. The general opinion now was that tubes giving off rays of high penetration were best for the treatment of deep growths, and that tubes of either high or low penetration might be used for superficial growths. There was now some evidence to show that a person who had been constantly exposed to the *x*-ray for a long time was liable to develop cancer of the superficial tissues. The notion that a person who had been tanned by the *x*-ray could not be burned must undergo revision, for he had recently had a case showing the falsity of this view.

**The Rontgen Ray as an Aid in Diagnosis.**—Dr. Herman Grad of New York made a plea in this paper for a systematic and extensive use of the Röntgen ray for the detection of gross pathological changes, just as the microscope was now depended upon for the detection of minute changes of this kind. Both the positive and negative value of the Röntgen ray in fracture were emphasized by the report of illustrative cases and the presentations of radiographs of the same. Some of the uses of the *x*-ray in general medicine were also dwelt upon.

**The Use of Galvanic Electricity in the Treatment of Cancer and Kindred Diseases.**—Dr. William Winslow Eaton of Danvers, Mass., read this paper. In the earlier cases reported in the paper the continuous current was used from a forty-cell battery. The strength of the current used varied up to 75 milliamperes ordinarily, the application lasting for fifteen minutes and the full strength being attained in two or three minutes. A number of cases were reported, some of them of a most desperate character, in which treatment by the galvanic current had resulted in marked improvement, and, in some instances, had kept the patient in comparative health and usefulness for a period of several years. Of the eight cases reported, one was living at the end of one year, one at four years, one at six and two at seven years after the treatment. These cases of internal cancer were advanced and inoperable. The author was of the opinion that this potent but harmless agent, the continuous current, should be used in every case of cancer, and should be reinforced, if necessary, by the use of the *x*-ray.

Dr. G. Betton Massey said he was convinced that in some cases of supposed cancer of the breast the use of the simple galvanic current had been followed by an increase of the growth, due, no doubt, to the increased nutrition of the part. He thought some of the cases reported might have yielded still better results, and without incurring undue risk, by the employment of mercuric cataphoresis.

Dr. A. D. Rockwell said that while he had been interested in the cases just reported, his own discouraging experience with the galvanic current in the treatment of cancer twenty-five years ago led him to feel that this question must still be considered as *sub judice*. It was probable that the good results secured by Dr. Eaton were largely attributable to the use of the *x*-ray.

Dr. Robert Reyburn expressed his belief that cancer was not a germ disease, but rather of the nature of a retrograde metamorphosis. The recently published views of Dr. Robert Bell of Glasgow gave color to the view that many factors, which caused deterioration of the general health, might enter into the etiology of cancer, and made it probable that the successful treatment of cancer in the future would embody careful and rational medical treatment.

Dr. Eaton, in closing the discussion, said that most of his cases had been treated before mercuric cataphoresis for cancer was known, and that it was only in the past two years that he had made proper use of the *x*-ray. In external cancer he had found the *x*-ray very efficacious, but apparently of little avail in deeply situated cancers. He was of the opinion that with the galvanic current there was a certain chemical dissolving effect that was not obtainable with the electrical modalities.

### *Thursday, September 24—Third Day.*

**Report of the Committee on Current Classification and Nomenclature.**—Mr. William J. Jenks, E.E., chairman of the committee, presented an exhaustive and highly instructive report. He said that the term "galvanic current" should never be used, and that, so far as possible, the term "constant current" should take its place. The faradic current should always be referred to as an induced current, or better still, as the magnetic induced current. The preliminary report presented by the committee one year ago had been sent to many electrical engineers, inviting their criticism, but up to the present time practically no criticisms had been received, thus indicating that the suggestions of the committee regarding nomenclature had met with very general approval. The speaker then exhibited a number of diagrams representing the combinations of primary static generators and secondary or modifying apparatus used by physicians. He said that it was evident that intelligent classification of these must be based primarily upon the curves which properly represented the resulting currents. The report here gave at length the observations and conclusions of Prof. Samuel Sheldon of the Brooklyn Polytechnic Institute. This observer, working with the well-known make of static machine, found that when this machine was running at 315 revolutions per minute without excitation it consumed 106 watts, and that the loss due to friction was 30 watts, or $\frac{1}{25}$ of a horse-power. After exciting the machine, the total power consumed was 184 watts, or about $\frac{1}{4}$ of a horse power. It had been found, to the surprise of the committee, that the machine, under certain conditions, would deliver 27 per cent. of the energy put into it by the motor. If the machine were operated with its discharging rods in contact the current should be directly proportional to the speed. While the discharging rods were in contact there was very little difference of potential in the parts of the machine situated between the collecting cones. The report then described three different kinds of currents obtained from these machines, viz., (1) The current taken from the discharging rods, the latter being separated; (2) the current taken from the outer coating of Leyden jars whose inner coatings were connected with the separated discharging rods, and (3) the current taken from a coil of wire connected with the outer coatings of the Leyden jars whose inner coatings were connected with the separated discharging rods. Mr. Jenks then went on to say that a condenser of large capacity would tend to produce relatively slow oscillations. The electrical engineer could determine in advance with mathematical accuracy the result that would be obtained by the introduction of such modifying devices, but when living human tissue was interposed an absolutely unknown factor was introduced as regards its effect upon the rest of the circuit. No accurate measurements, so far as known, had yet been made with regard to the effect of the human body on currents of alternating character and high pressure. This physically active section of the external circuit must, therefore, be investigated before one could determine the curves of the currents employed. Dr. Kellogg had made a series of experiments on the curves of the currents employed by physicians, but apparently without the patient in the external circuit. The various currents employed in therapeutics were then described in detail with the aid of diagrams.

**A Plea for an Accurate and Scientific Method of Röntgen Ray Treatment.**—Dr. MIHRAN K. KASSABIAN of Philadelphia presented this paper. He exhibited a ruled blank record with headings intended to provide for accurate notes concerning the history of the patient, the kind of apparatus and technique employed, and for the diagnosis. It was advised that photographs should be taken just before and immediately after treatment on isochromatic plates, and, if possible, life size. Instruments for measuring the interruptions and the power of individual *x*-ray tubes were described and criticised. The author insisted that the effect upon the patient was not dependent upon the length of the exposure, but upon the number of interruptions and the extent to which the tissues were penetrated. One great difficulty encountered in practice could be eliminated by employing self-regulating tubes. It was recommended that a voltmeter and an ammeter be introduced where the current goes into the primary, and so determine approximately the intensity of the rays, because other methods of measurement were dangerous either to the hands or eyes of the operator.

Mr. R. G. BROWN, E.E., remarked that he could not see that any reliable measurements could be made with the meters placed as described, and in this opinion Dr. Boggs concurred.

**Perineuritis.**—Dr. A. W. BAER of Chicago read a paper with this title. The author called attention to the fact that one of the best means of differentiating between facial neuralgia, due to suppuration at the root of a tooth, and a neuritis was by the application of electricity. When there was abscess formation the patient almost invariably complained of increased discomfort when electricity was applied. The static treatment was the easiest, but it was not so beneficial as the continuous current. Several cases were reported.

Dr. A. Z. GOODELL of Salem, Mass., reported a case of severe neuritis and writer's cramp that had yielded most satisfactorily and promptly to the high frequency derived from the Kinraide coil.

**The Electrothermal Bath.**—Dr. CHARLES H. SHEPARD of Brooklyn recommended in this paper the conjoined use of the hot-air bath and of electricity as a means of improving nutrition.

Dr. W. J. HERDMAN thought it very encouraging that a hydrotherapeutist should take such a broad view of the subject. The use of the induced current afforded an admirable stimulant and corrective for the debility consequent upon the use of the bath as an eliminant.

**Death of Dr. Robert Newman.**—Suitable resolutions on the death of Dr. Newman were adopted, and a committee was appointed to collect his writings into one volume.

**Officers Elected.**—*President*, Dr. A. D. Rockwell of New York; *First Vice-President*, Dr. Willis P. Spring of Minneapolis; *Second Vice-President*, Dr. William Winslow Eaton of Danvers, Mass.; *Treasurer*, Dr. Richard J. Nunn of Savannah, Ga.; *Secretary*, Dr. Clarence Edward Skinner of New Haven. *Executive Committee*, Dr. Francis B. Bishop of Washington, D. C.; Dr. Daniel R. Brower of Chicago, and Dr. Maurice F. Pilgrim of New York.

**Next Meeting.**—The next annual meeting will be held in St. Louis on September 13, 14, and 15, 1904.

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## MEDICAL SOCIETY OF THE STATE OF PENNSYLVANIA.

*Fifty-third Annual Meeting, Held at York, September 22, 23, and 24, 1903.*

**Special Report to the Medical Record.**

*Tuesday, September 22—First Day.*

THE meeting was called to order at 9.30 A.M. by the President, Dr. William M. Welch of Philadelphia, and was opened with prayer by the Rev. E. T. Jeffers, of York after which addresses of welcome were delivered by Hon. M. B. Gibson, Mayor of York, and Dr. N. C. Wallace, President of the York County Medical Society.

**The Address in Surgery** was delivered by Dr. WILLIAM L. ESTES of South Bethlehem, in which the author discussed the prognosis of surgical cases, believing the most important elements to be heredity, environment, and habits and physical condition.

**The Address in Hygiene and State Medicine** was delivered by Dr. SENECA EGBERT of Philadelphia. He called attention to the fact that in 1900 the population of those districts of the United States in which a system of mortality registration had been organized was 28,807,269, as compared with 19,659,440 in 1890: the death rate during the intervening decade having decreased from 19.6 to 17.8 per 1,000, which would mean the saving of 51,853 lives in the registration area annually. He demonstrated the value of the purification of the water supply, installation of better systems of sewage-removal and disposal, supervision of milk and food, improved quarantine regulations, improved street pavings, development of parks, etc., by giving statistics showing the mortality rate in different cities before and after the introduction of these factors. He remarked particularly the value of preventive measures for the avoidance of smallpox, pneumonia, diphtheria, scarlet fever, typhoid fever, malaria, and believed that in order to secure the best results the co-operation of the general public should be secured, which could best be done by as free a dissemination of knowledge on sanitary subjects as possible.

**The Address in Neurology** was delivered by Dr. CHARLES B. MAYBERRY. He argued for better results in the treatment of the insane, which he believed could be obtained by (1) More extensive instruction psychiatry, both didactic and clinical, in the courses of our medical schools; (2) The construction of small psychopathic hospitals for the separate treatment of the acute curable insane; (3) The organization of a system of out-patient departments, by which the discharged patients may be kept under observation for one year after leaving the institution; (4) The creation of a central laboratory for the investigation of pathological conditions underlying mental disease.

**The Practical Treatment of Pulmonary Tuberculosis** was the subject of the Address in Medicine, which was delivered by Dr. H. M. NEALE of Upper Lehigh. He said he believed that improved nutrition of the patient by forced feeding, not however to such an extent to overburden the stomach, was one of the most important factors in the treatment of consumption. This should be in conjunction with fresh air, sunlight, rest, and cleanliness. He did not believe high altitude was essential to the cure of consumption, and, in fact, felt that it was detrimental, if the patient purposed returning to his home later, for the dilatation of the air vesicles induced by the prolonged

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## Original Articles.

### RADIUM: WITH A PRELIMINARY NOTE ON RADIUM RAYS IN THE TREATMENT OF CANCER.*

By MARGARET A. CLEAVES, M.D.,
NEW YORK.

NOT only the scientific world, but the lay as well, listens with bated breath to the marvelous tales of radium; tales which, especially when accompanied by demonstrations of the apparently magical phenomena of this new element, seem more befitting fairy lore than abstruse scientific fact; and one can but wonder whether radium may not prove a veritable Aladdin's lamp to medical science as well as to physics.

"All nature is vibrating, from the lowest musical note to the highest pitch of the chemical rays," and in radium the highest form of etheric vibration is to be found.

The electrotherapeutist with his high-frequency discharges from vacuum tubes, his ultraviolet rays, his cathode and *x*-ray must, of necessity, have not only a scientific but a practical interest as well in radioactivity.

Radium, polonium, uranium, actinium, and thorium form a group of radioactive metals which have been extensively experimented with, and studied by Professors Becquerel, Thompson, Rutherford, Crookes, Lodge, Laborde, and Professor and Mme. Curie.

With radium, polonium, actinium, and thorium light is given off the moment they are created, without having to be stimulated by any form of heat, light, electricity, or any other form of energy so far as is at present known.

A vast amount of speculation and some interesting hypotheses have been evolved to exlain the phenomena observed in experimenting with these substances. "It is believed that from them much will be learned about the constitution of matter and the co-relation of the vital and physical forces, more, in all probability, than any substances which have been created since the world began."

Following upon the investigations into the phenomena produced on the interior and exterior of various kind of vacuum tubes to which great importance must be attached, came the discovery in 1896 of M. Henri Becquerel of the radiations emanating from uranium and which are known as Becquerel rays. A vast array of well-known names is associated with investigations into vacuum-tube phenomena, names which are veritable household words to the physicist, among whom may be mentioned, Varley, Hittorf, Crookes, Lenard, Röntgen, Hertz, J. J. Thomson, Goldstein, Schmidt, Ebert, Weichert, Geissler, Kauffman, Puluj, Perrin, Villard, Wien, Weidemann, Majorama, Birkland, Deslandres, Poincaré, Edison, Tesla, Rowland, Michelson, E. Thomson, Moore, Rollins, and Campbell-Swinton.

To Becquerel, however, the science of radioactivity owes its foundations.

In 1898 Prof. Pierre Curie and Mme. Sklodowska Curie, when investigating the radiations from uranium discovered by Becquerel, found that some samples of pitchblende or uraninite, from which uranium is extracted, gave forth radiations much more powerful than any uranium they had found, having four times the activity of metallic uranium.

Painstaking research resulted in the discovery of a substance associated with bismuth and resembling it very much in its chemical characteristics. To this substance Mme. Curie gave the name of polonium, in honor of Poland, the land of her nativity.

Polonium is to be had in the form of a metal and in the form of a subnitrate. The metallic polonium resembles particles of nickel and the subnitrate is a white powder. The only specimen of metallic polonium in this country is in possession of Mr. W. J. Hammer, from whose exhaustive and interesting monograph[1] on radium many facts set forth herein have been gleaned. He also has the subnitrate, and both specimens possess an activity of 300. Just here it may be well to state that the radioactivity of uranium is taken as a standard of comparison, and polonium of 300 radioactivity, or radium of 7,000 radioactivity, means that the one is 300 and the other 7,000 times more powerful than the original radiations emanating from uranium or Bequerel's rays.

In the same year, 1898, Professor and Mme. Curie isolated a second substance from pitchblende, which was associated with barium and possessed many chemical and other characteristics of that substance. To this they gave the name of radium. In 1899 Debierne discovered actinium.

Radium, actinium, and polonium have a million times the activity of uranium, according to Professor Curie.

Gietel finds that polonium has both deviable and non-deviable rays, and Elster states that when it is placed in a vacuum it is found to be deviable by a magnet to a much greater extent than radium. The rays from actinium are also deviable, while the rays from radium are deflected from a straight line, differing in that respect from the Röntgen or *x*-ray.

Professor Curie regards radium as distinctly a new metal; it has never been found, however, in a metallic form, but it is to be had as a chloride or bromide.

Radium bromide is the strongest radium salt yet produced, and there is but little of it in existence, the amount having been estimated at as little as four grams. This statement probably refers to activities higher than 7,000. All radium of higher radioactivity than 7,000 has until recently been retained for the experiments of Professor and Mme. Curie and their associates, but recently information was received from Director Boulay of the Société Centrale that they expected shortly to put upon the market a preparation of radium, chemically pure, or nearly so, at a cost of $6,000 per gram. It is estimated by Professor Curie that the three years' work done in both Germany and France had, a few months ago, resulted in the production of but one pound of radium, including all grades and qualities. There has been no radium on the market in this country, until very recently, save the German radium, which Professor Curie has never found to have more than 300 radioactivity. Recently, however, there has been imported, from the Société Centrale, the French radium prepared in the laboratories of Professor and Mme. Curie, of both 3,000 and 7,000 radioactivity, in sealed glass tubes containing a decigram each.

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*Read at the meeting of the American Electrotherapeutic Association, Atlantic City, September 22-24, 1903.

The radiations of radium have the power to penetrate opaque solids as does the *x*-ray. It has been demonstrated, however, by the work of Becquerel, the Curies, Rutherford, and others that there are three distinct types of rays emanating from radium, known as the "*A*," "*B*" and "*R*" rays. In the first instance it was pointed out by Rutherford that uranium possessed two distinct types of rays, "*A*" and "*B*," the former easily absorbed even by gases, whilst the latter are very penetrating but little absorbed by gas. In radium the "*A*" rays constitute the major proportion, are by far the most important class, and are the most active in the ionization of the gas which has been observed under experimental conditions. They are the rays which possess certain characteristics of the Röntgen or *x*-rays, and in a strong electrical field 45 per cent. of them have been deflected by Rutherford. They are readily absorbed and a thin screen of metal suffices to cut off the most of them. Hammer shows, among a considerable number of radiographs, one of a steel tool made by radium in twenty-four hours, acting through two thick *x*-ray plate envelopes, of a mouse made in twenty-four hours by laying it directly on the plate, and of a mouse in a trap, exposed for three days. In the latter the wooden part of the trap is transparent as with the *x*-ray. He also photographed a dead human hand, exposing it for eight days. A slight trace of the bones can be seen. It is supposed to be the first picture of the human hand made with radium. Through Mr. Hammer's courtesy I am enabled to show these radiographs to the association.

Rutherford estimates that the energy of the "*A*" rays is a thousand times greater than that of the "*B*" rays, and is also authority for the statement, that all radioactive substances, including polonium, as well as excitable bodies and their emanations, give out "*A*" rays.

The "*B*" rays are much longer, have greater penetrative power, are readily deflected by a magnet and correspond in every particular to the cathode rays.

With them electrified bodies are discharged by ionization of the air, photographic plates affected, etc. These rays are projected from the cathode at a speed approximating 70,000 miles per second. They were proven by Villard, in 1899, to be negatively electrified corpuscles or fragments of atomic hydrogen. These "corpuscles" so named by J. J. Thomson are shown by him to be the one-thousandth of the mass of a hydrogen atom. The "*R*" rays are the rays possessing the greatest penetrative effect, and they will excite or produce radioactivity at a distance of three feet or more. Rutherford's experiments show the relative penetration of the three classes of rays through aluminum sheets of varying thickness before there is a loss of half the intensity, which is formulated as follows:

"*A*" rays through a thickness of aluminum .0005 cm.

"*B*" rays through a thickness of aluminum .05 cm.

"*R*" rays through a thickness of aluminum .8 cm.

According to Professor and Mme. Curie, radium rays act in many ways like light.

They reduce silver salts, peroxide of iron, and bichromate of potash in presence of organic substances; while glass, porcelain, and white paper are colored by them, and yellow platino-cyanide of barium is transformed into the brown variety.

Becquerel, in referring to the chemical action of radium rays, states that white phosphorus is transformed into red in twenty-four hours, mercuric chloride, in the presence of oxalic acid, is reduced with the precipitation of calomel, and after long exposure the germinating power of seeds is destroyed. To the same chemical action the coloration of glass, porcelain, paper, and certain crystals, as well as the painful physiological effects, are due. The coloring of glass by radium rays finds it counterpart in the coloring of *x*-ray tubes. Those who have tubes steadily in use, have noted that often they assume a violet tinge similar to the flask spoken of by Hammer, colored by radium rays. It is also found by Becquerel that radium rays have the same power as the electric spark, under exposure to heat, of restoring phosphorescent properties to a body deprived of them by overheating. The same is true of ultraviolet light.

Diamonds exposed in the dark to radium rays fluoresce and scintillate in the most brilliant fashion. False stones are therefore easily detected.

By its action gases are thrown into a state of vibration which causes the production of their characteristic spectrum. The phenomena of the emission of heat is unique and unprecedented, and a given specimen emits sufficient heat in an hour to melt its own weight in ice; while it maintains itself at a temperature of 1.5° C. above that of the sorrounding medium. Nor is it affected by a wide range of temperature, the emission of heat going on without perceptible variation, whether on a summer day or at the temperature of liquid air. A sample of bromide of radium, weighing 0.7 gram, tested by Dewar's method, was found to be capable of volatilizing an amount of liquid oxygen and hydrogen equivalent respectively to 6 c.c. and 73 c.c. of the gases measured at the ordinary temperature. In liquid hydrogen, however, radium shows that it is not always unaffected by external temperature, for, within a comparatively short distance of the absolute zero, the emission of heat, so far as present data can be relied upon, is augmented at the temperature of liquid hydrogen. This extraordinary phenomenon is increased in intensity at a point where all but the most powerful chemical affinities are in abeyance. This tremendous evolution of radiant energy goes on perpetually without combustion, without chemical change of any kind, without alteration of the molecular structure of the radium salt and without appreciable loss of weight. For one square inch of surface this loss of weight in ten million years is estimated at but one gram.

All of these facts are an apparent violation of the law of conservation of energy. From a close study of the phenomena exhibited by radium, Professors Crookes, Laborde, and Curie adduce an hypothesis that falls into harmony, not only with the law of conservation of energy but as well with the periodic law of atomic weights, or Mendeleeff's theory.

They discard the old atomic theory and tell us that each atom is composed of a definite number of infinitely smaller but absolutely identical units, "each in constant motion in its intraatomical orbit.

Thus the hydrogen atoms consist of 700 "ions," the oxygen atom contains 11,200 "ions" and gold 137,200 "ions" per atom. The 120,000 "ions" which compose a radium atom are in such a violent state of vibration or revolution in their orbits, that they are constantly flying apart and escaping from the atom into the ether, similarly as meteors leave the solar system.[2] This active dissociation of intra-atomical units is termed radioactivity.

Professor Lodge regards this atomical disintegration as the normal process of nature, but proceeding at so slow a rate in the more stable atoms, that millions of millions of centuries would be consumed in its completion, while in radium the process is so rapid it can be observed.

The Curies put forth two hypotheses as to the source of the energy of radium. "One of these consists in supposing the atoms of radium evolving and transforming into another simple body, and despite the extreme slowness of that transformation, which cannot be located in a year, the amount of energy evolved in that transformation is tremendous. The second hypotheses consists in the supposition that radium is capable of capturing and utilizing some radiations of unknown nature which cross the space without our knowledge.[3]

The theory is advanced by Professors J. J. Thomson and Rutherford that there is a succession of chemical changes going on, causing the spontaneous projection of larger masses of material at enormous velocities, and that while certain portions are constantly dying out and becoming inert, other portions are constantly increasing in strength and power.

Substances which have been in contact with radium become radioactive and their radioactivity lasts for varying periods of time. Professor Curie states that it is impossible for him to go near his instruments to make any measurements for hours, after being near radium, and those who works with it, find it extremely difficult to keep their tools, instruments, and themselves free from the radioactivity imparted by the radium. Falling rain and snow are for a time quite powerfully radioactive, and lightning rods and even the leaves of trees also become radioactive. It was found by McLennan that rain caught in a vessel and immediately evaporated to dryness, imparted a radioactivity to the vessel. Hammer found a piece of cardboard, which had formed the box holding his radium, luminous in the dark after six days. This radioactivity was stimulated by burning magnesium wire before it.

Physiological effects: Becquerel, Gietel, the Curies, and others have given important evidence as to the serious physiological effects of radium. Becquerel from carrying a specimen in his pocket for six hours received a serious burn on his abdomen. Hammer felt the effects for weeks from carrying a wooden box containing eight tiny tubes under his arm for several hours. He also experimented with an electric torpedo in the Aquarium at Naples by placing six tubes of radium on the back of the fish, which is shaped like a flounder, leaving them there for twenty minutes.

Prior to doing this, both he and the members of his party had received powerful shocks from the torpedo's batteries. Upon removing the radium he tried for fifteen minutes to get a shock from the fish in the same manner as before but without success. He admits that the fish "might have been out of shocks," but the question which naturally arose was whether a partial paralysis had not been induced by the action of the radium rays. This seems more than plausible in view of the fact that Professor Curie found that a few milligrams of radium introduced beneath the skin of a mouse over the vertebral column produced death by paralysis in three hours; and tubes of radium placed in contact with the back of the neck of guinea-pigs have paralyzed these animals in a few hours, according to the length of the exposure.

M. J. Danysz[4], in a report to the Academy of Sciences, states that the application of a tube containing a salt of radium to the skin produces an ulcer in from eight to twenty days. A few moments application is followed by a congestion of the human skin. When applied to the skin of a rabbit, destruction of the epidermis follows, but when applied under the skin there is only a feeble reaction on the epidermis. It seems to penetrate the muscles with difficulty. Danysz also found that the intestines and the serous surfaces, when the tubes containing the radium were introduced into the cavity of the guinea-pigs and allowed to remain for several hours, were but little affected, and no lesions produced comparable to those of the skin. Its action upon the nerve centers was noticed in all animals, subjected to experiment, but it was comparatively feeble in those whose osseous tissue protected the nerve centers. Application of the tubes containing the salt to the cranium caused paresis, ataxia, and convulsions, followed later by death. The same observer found that the salts of radium dissolved in distilled water, emits certain emanations which prevents the development of anthrax bacilli. E. Aschkinass and W. Caspari[5] found that the germs of the *micrococcus prodigiosus* when exposed to a radium preparation were effectively killed in about three hours by the action of the ray. The ocular phenomenon or sensation of light when a tube is held close to the eye or near the temple is one of the most familiar of the phenomena of this agent. This is attributed, by Hammer, to the phosphorescence of the pupil of the eye, and also to a possible effect on the nerve centers. Interesting in this connection are the observations of M. Javal[6] who suggests that blindness, with alteration of the retina, can be distinguished from that due to glaucoma or corneal opacity, because patients with the latter conditions see rays from radium as well as do those of sound vision. This would indicate, to the writer's mind, that the effect is upon the nerve center. Professor Curie is authority for the statement that he would not care to trust himself in a room with a kilo of pure radium, as it would burn all the skin from his body, destroy his eyesight, and probably kill him. From its physical properties and physiological effect, a therapeutic action is predicated. As yet there has been but little done.

M. Danlos[7] reports a case of lupus of the face exposed at two points to the action of a salt of radium which had a radioactivity of 19,000 for from twenty-four to thirty-six hours. The result was disappearance of the disease with the formation of a smooth, white cicatrix, blending into the surrounding normal tissue.

M. M. Hallopeau and Gadaud[7] report that too prolonged exposure to the emanations from radium led to atonic ulcerations which lasted from five to six months. Dr. Blandamour has also used radium in lupus. His best results followed the use of salts with a radioactivity of 5,200 and 19,000 respectively.

The exposures were made from twenty-four to forty hours, and were followed by profound erythema with maceration of the tissues exposed and even ulceration. The recovery was perfect and the cosmetic effect good, the resulting scar being white, smooth, and soft. By modifying the power of the radium and shortening the exposure, he expressed the hope that the desired effect might be obtained without ulceration. Recently there were two cases reported to the Viennese Society of the Imperial Academy of Science,[8] which had been submitted to the action of radium. One, a man, aged sixty-two years, had been repeatedly operated upon for cancer of the palate and lip, but with no benefit. Further operative measures had been declared useless. In the published report falling under the writer's notice, the radioactivity and technique were not given, but a bromide of radium was used. The tumors gradually and completely disappeared. The patient was treated in the clinic of the late Professor Gusenbatter. The second case was one of melanosarcoma, which was also reported cured.

Equally interesting is the case of Mr. Mackenzie Davidson at the Charing Cross Hospital, London. A recurrent epithelioma of the nose, rodent ulcer type, unsuccessfully treated by the *x*-ray, was exposed for a short time to the action of radium. Four exposures, aggregating an hour, were given at intervals of a few days. In three weeks time healing was established, and in six weeks, after two other applications, the cure was complete.

For two years the writer has entertained the thought of trying the radium emanations in the treatment of malignant diseases, but owing to the limited supply, as well as the great expense, it was only recently made possible.

On September 15, through the courtesy both of Prof. Charles Baskerville, Director of the Laboratory, Department of Chemistry, University of North Carolina, and Eimer & Amend of New York, the writer was enabled to use one gram of bromide of radium contained in a sealed glass tube, and having a radioactivity of 7,000 in the treatment of two cases.* One, a case of sarcoma involving the left cheek, entire buccinator region, and the mucous membrane of the lower left maxillary region, from the extreme angle of the jaw, extending upward and along the ramus of the jaw; the other, an inoperable primary pelvic case of epithelioma, involving the cervix, anterior and posterior vaginal walls, almost to the introitus; rectum, bladder, and both broad ligaments. Both cases have been under treatment, the first for five weeks, the second for three months, by means of the *x*-ray and ultraviolet light, and both had been declared inoperable by the best surgical talent.

The case of sarcoma had been treated by external applications of the *x*-ray, twelve exposures for one month prior to coming under the writer's care, and not only without improvement, but with a steady loss. Since under care, now five weeks, the *x*-ray has been applied to the interior of the mouth as well as externally and applications of ultraviolet light, through focusing quartz lenses from a 25 ampere arc, made as well. By this treatment the patient had been relieved of the intense pain for varying periods of time, but the relief did not persist. When first under treatment he gained three pounds. This he had lost, pain and distress were constant, facies, anxious and worn, sleep very much impaired, appetite poor, progressive loss in weight, intense headaches. The ulcerated area was larger, and on September 11 was covered with a dirty grayish exudate, foul to a degree, with ragged and necrotic edges.

The growth involving the region of the buccinator muscle was tense, hard, and extremely painful. Just inside the mouth under the upper lip, left angle of the mouth, there were two prominent tubercles; unable to open his mouth, save for a scant half an inch, and impossible to take anything but liquid food. On the night of the 13th and the morning of the 14th of September he had a severe hemorrhage. Duration of the disease is placed at one year. Active evidences followed removal of an upper tooth one year ago. Tooth removed because of pain. Disease has steadily progressed since that time. September 15, 1903, the growth involving the left buccinator region was exposed to the radiating surface of one gram of radium bromide, of 7,000 radioactivity and contained in a sealed glass tube. The tube was held by means of a pair of long dressing forceps at three-quarters of an inch from the skin for ten minutes followed by a five-minute exposure made in the same manner to the skin over the ulcerated area. Upon the suspension of treatment the patient said he was relieved, and that he could open his mouth with greater ease and comfort, and that he felt better than any time since coming under care. He reported, on the morning of the 16th, that he had slept better the preceding night than for three months, that he suffered no pain and was only wakened by the dribbling of the discharge from his mouth. On the way to the writer's office he had a feeling of faintness which was ascribed to his weakness and the intense heat and humidity. Appetite better, the 15th after treatment and also the morning of the 16th. Opened his mouth the merest trifle wider and without pain. Practically no odor and but little discharge, no pain save a little upon deglutition, feels well.

Physical Examination: Facial expression bright and pain free, looks rested; indurated tissues softer and more yielding to touch, softness characterizing the more superficial part of the induration; mucous membranes pale (pallor since use of radium), ulcer not so dirty looking but still gray in appearance. September 16, radium rays used as before, the surface exposure lasting but ten minutes; then the tube of radium salts was placed in a small test tube, the upper lip raised and an application of two minutes made at the upper left angle of the mouth, directly to the tubercles.

September 18, 1903. In response to the morning salutation, instead of the former "not any different" or "I am in great pain" the response was prompt and cheery "I am very well." Restless in the night, but no pain, discharge thinner, diminished in quantity and of different odor, *i. e.* not characteristic. Present condition, no pain save a slight sticking pain to left of left alæ nasi, indurated tissues much softer, softness extending deeper than on the 16th. Ulcer clean and bright, red at its base, edges still somewhat ragged, entire surface of ulcerated area bathed in an exudate serous rather than characteristic gray. The upper lip at the left angle before immobile with prominent tubercles is now readily handled, the tubercles are much smaller and the mucous membrane is smoother and of a more healthy color.

Five days subsequently the patient was still almost entirely free from pain and was conscious of the cavity inside the mouth. This he had not spoken of at any time before. As there has been a good deal of numbness in all the affected tissues, it is thought that this simply indicated a return to normal sensibility, as the anæsthesia was better elsewhere. Discharge still about the same in quantity, thin and of a serous nature; no characteristic odor, sleep improved; appetite fair; induration softer than at previous visit; mucous membrane has lost the profoundly anæmic appearance which followed upon first treatment. The reaction established in the ulcerated area has passed, the circulatory conditions are less good and there is more gray exudate with ragged edges.† The usual *x*-ray treatment was given at this time, as the writer had been obliged to return the tube of radium to Professor Baskerville.

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*Since reading this paper a third has been added to the list, a recurrent epithelioma, rodent ulcer type, involving loss of scalp and skull plates (the latter from arsenical paste) of from four to five inches in lateral and anteroposterior diameter. This case was treated September 25 for ten minutes.

†September 25, 1903 Better, has gained one pound; no pain until September 24; no odor; discharge as before; ulcer cleaner; edges smooth; normal color, induration less.

The pelvic case had been under care for three months and has improved to date under the combined influence of the *x*-ray (internal applications entirely) and ultraviolet light. Infiltration of vaginal walls is largely absorbed, hemorrhage under control, discharge also and the foul odor has entirely disappeared. Healing has taken place in the ulcerated area involving the cervix and the right posterior fornix. The patient's general condition is much improved, there is no characteristic pain, no cachexia, no loss of weight, her functions are well performed and she eats and sleeps well. There is, however, a discharge of blood from the rectum upon defecation and now and then at other times. Because of this, and believing that the radium rays would penetrate more deeply than the *x*-ray, the radium was used.

Prior to its use a physical examination was made showing elastic vaginal and rectal walls, no bleeding from the manipulation, no discharge, no odor, no ulcerated tissue, no pain, but the cervix uteri and adjacent vagina through the glass water-jacket of a vaginal *x*-ray tube, inserted to contain the tube of radium, were seen to be intensely congested, just ready to bleed, and streaks of blood were numerous, especially from the right fornix and posteriorly. In this water-jacket, closed at its distal end, the tube containing the radium bromide was placed and allowed to lie on the posterior surface of the water-jacket for five minutes. It was then held five minutes more near the anterior surface of the tube, because of the vesical involvement.

September 16, 1903, the cervix uteri was found to be completely blanched and also the vaginal walls, with here and there tiny little punctate spots of bright red, not larger than the smallest pin head. There was no discharge, no odor, and no pain. The writer questioned the advisability of making another exposure at this time, but as it was the only opportunity of doing so before returning the radium to Professor Baskerville, a five-minute application was made as before.

September 18, 1903. Speculum examination showed the cervix uteri and vagina intensely congested and bleeding; no treatment given. It is evident from the reaction that a mistake was made in reapplying the radium in this case on the second day.

September 21, 1903. Five days subsequent to the use of radium, no bleeding, no odor, no discharge, no ulceration, and vaginal and cervical mucous membrane normal in appearance. General condition good, but complaining of some vague discomfort, which may be attributed to the fact that her occupation necessitates much standing and walking. There has been no bleeding from the rectum since the radium was used.*

This report is made because, taken in connection with the experience of others, it seems to foreshadow an important place in medicine for radium. The writer offers no opinion as to the outcome of these two cases. They will be carefully watched and ultimately reported. The technique evolved is given, in the absence of any knowledge on the subject. It may not stand the test of time. Further experience can only prove this. There is absolutely no guide for the therapeutic applications of radium, and the writer preferred to err on the side of least danger to the patient. The profound physiologic action obtained would seem to indicate that the more powerful activities and long exposures are not necessary.

Of the three sets of rays in radium "*A*," "*B*," and "*R*" evidence points to the identity of the "*A*" ray with the Röntgen or *x*-ray, in the matter of penetrating opaque bodies. This and subsequent facts suggest to the writer's mind, a corroboration of the position taken by the Drs. Shields,[9] that it is not the *x*-ray, but the cathode ray which establishes physiological action and secures a therapeutic effect. To *x*-rays however produced, whether from an excited *x*-ray tube or a radium salt, the power of penetration of opaque bodies is then due. In the "*B*" rays a higher vibration is reached analogous to the cathode rays, while in the "*R*" rays a still higher degree of vibration is attained, capable of a more powerful chemical action and profounder physiological effect. This is what we seek in combating diseases of the nature of cancer. In a daily experience with these cases the writer has come to feel that if a higher, more penetrative and a more active chemically disorganizing vibration than is obtained from an *x*-ray tube could be applied, in a *lethal dose*, to the cancer cells, better results would necessarily accrue. So much is accomplished with the *x*-ray that one can but feel that an energy of the same kind, but of greater intensity, would do more. In establishing the treatment by means of radium rays the purpose would be best met by a full dose, whatever that proves to be, in order to act destructively upon the foci of disease.

The fact that radium emits rays of a greater penetrating power and of a higher vibration than the cathode rays, *i.e.* the "*R*" rays taken in connection with the change in appearance and relief obtained in the writer's case of sarcoma and the cure of the cases reported, stimulates the hope that in radium a therapeutic measure of value over and above the *x*-rays is at command. In the case of sarcoma the best resources of excited *x*-ray tubes has been faithfully tried, even to the production of an *x*-ray dermatitis, but up to the time of the use of the radium he was rapidly losing ground. Unless radium should prove for him an Aladdin's Lamp of more than fabled power, he is doomed.

There are submitted herewith two tubes of radium bromide, one containing a decigram of 3,000 and the other a gram of 7,000 radioactivity. At night, in the dark, they look like glow-worms as they lie on my study table. They can be placed within the accessible mucous cavities, according to the location of the disease, within the nose, uterus, or urethra, and a device could unquestionably be constructed permitting the placing of one in the œsophagus or stomach even, if it is found that a mucous membrane contact is the better one. In breast cancer a puncture could be made with the electrocautery, in order to secure a bloodless opening, and the tube could be carried directly within the malignant mass.

To the over-tired *x*-ray machine and tube worker, the thought of securing the same, and perhaps better, results with one of these quiet, inoffensive, and unaggressive tubes of radium salt is entrancing. The use of radium can never be common, not alone on account of the initial expense, but because of its scarcity. The tube with which the writer's work has been done is valued at $200. Future work will be done with the same radioactivity.

Just here, as showing not only the unity of scientific interest but the universality of humanitarianism, is appended a letter received from Professor Baskerville on the 21st.

My Dear Doctor: . . . I am very glad you kept the radium long enough to make some use of it, and I wish to say right now that while I wanted it here and shall need it off and on, if you can save the patient about whom you write so interestingly, by its use, wire me and I will send it back to you.

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*September 28. Is looking and feeling well. No symptoms; still no bleeding from rectum since radium first used, two weeks since.

Yours very truly,
CHARLES BASKERVILLE.

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N AVENUE.

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# STRICTURE OF THE MALE URETHRA.

## DEFINITION, ETIOLOGY, PATHOLOGICAL ANATOMY, SYMPTOMS, AND CLINICAL COURSE.

By HENRY G. SPOONER, M.D.,
NEW YORK.

A STRICTURE is a narrowing of the normal dilatable diameter of the urethra, caused by organic alterations in its wall. This lessening of the normal dilatability advances slowly and progressively, causing secondary affections of the entire urinary tract.

In this definition we do not include transitory conditions, such as the so-called inflammatory strictures, which are caused by swelling and œdema of the mucous membrane. In the acute stage of gonorrhœa we have such an intense swelling of the mucous membrane of the urethra that the patient can pass his urine only with difficulty. In this case we have a narrowing of the normal dilatability of the urethra, but the hindrance to micturition gradually disappears without leaving any permanent narrowing of dilatability.

When the folds of the urethra are encroached upon from without by abscesses, hemorrhages, or by an enlarged prostate, we speak of such conditions as compression strictures.

Under all circumstances urethrospasmus is a transitory phenomenon. This spasm of the urethra is a reflex action, caused by strong irritation in the urethra or its vicinity. There is no more reason for speaking of this condition as a stricture than there is in the case of spasmus glotticlis, or spasm of the rectum. The spasm always occurs in a reflex manner, in contradistinction to the sympathetic purely nervous urethral spasm, which comes on under psychical influences, such as anger, shame, or fright.

The spasm renders a certain hindrance to the passage of a sound that is just as apparent as if there were a true organic stricture.

Thus it can be seen we reserve the term of "stricture" for an organic and permanent narrowing of the normal dilatability of the urethra.

From an etiological standpoint strictures are divided into two groups: (1) Inflammatory strictures, and (2) traumatic strictures.

As chronic gonorrhœa is the most evident cause of the first group, these strictures are commonly called gonorrhœal strictures.

Since Sir Henry Thompson proved statistically the number of strictures that were caused by a chronic gonorrhœa, all the later authors have taken this view. Thompson gathered 220 cases of stricture of the urethra. In 164 cases gonorrhœa was the only cause.

As not every clap leads to a stricture, we are compelled to assume that harsh medical treatment causes one patient to get a stricture, while his more fortunate contemporary who is more scientifically treated, escapes.

The early use of strong solutions of corrosive sublimate, silver nitrate and chloride of zinc used to abort the disease have been found to be particularly responsible for the development of strictures.

The injections now used, such as the newer silver compounds, by preventing the chronicity of gonorrhœa, prevent the formation of strictures.

Tertiary syphilis, in the form of a gumma, leads to the formation of a stricture. Sometimes the healing of a tuberculous ulcer of the urethra causes the same result, but these conditions are rare.

We next come to traumatic strictures. Blows or falls on the perineum arising in all possible ways may lead to the formation of strictures. A tear in the urethra may occur with or without outer wounds. A callous forms and leads through the contraction of scar tissue to the narrowing of the normal dilatability of the urethra at the location of the injury.

Fractures of the pelvic bones are very often complicated with a torn urethra. Nearly all these injuries pass through the pars-fixa urethræ, while the pars pendula is hardly ever involved—the pars pendula may be ruptured in cases of chordee, owing to an attempt of the patient in his anguish to straighten the curved penis.

Bullet wounds of the urethra are very rare—there were only 105 cases in our civil war. In the Franco-Prussian war there were only eight cases. In these cases the prognosis is very unfavorable, as grave complications nearly always set in.

Any foreign body that passes through the urethra, such as a stone from the bladder, or any instrument or article that is introduced into the urethra, may cause a tear which, when cicatrization sets in leads to the formation of a traumatic stricture.

*The Pathological Anatomy.*—Strictures of the urethra were known to classical antiquity, but the most peculiar theories were advanced concerning their origin and pathological anatomy. The formation of what was called "proud flesh" and "wild flesh" were regarded as the pathological changes.

John Hunter was the first man to hold more correct views. He differentiated the permanent urethral strictures caused by structural changes in the urethra from the purely spasmodic and from those caused by compression of the urethra by outside growths.

With the histological work that has been done during the past twenty years concerning chronic gonorrhœal urethritis and strictures of the urethra our knowledge of the pathology of strictures has advanced. The works deserving particular attention are those of Dittel, Wossidlo, Oberländer, Finger, Wasserman, and Halle.

To-day we know that the gonorrhœal stricture rests on the same pathological process as chronic gonorrhœal urethritis, and that both diseases can only be gradually differentiated. In other words the gonorrhœal urethritis is the first stage of a pathological process whose end is that of the formation of cicatricial tissue.

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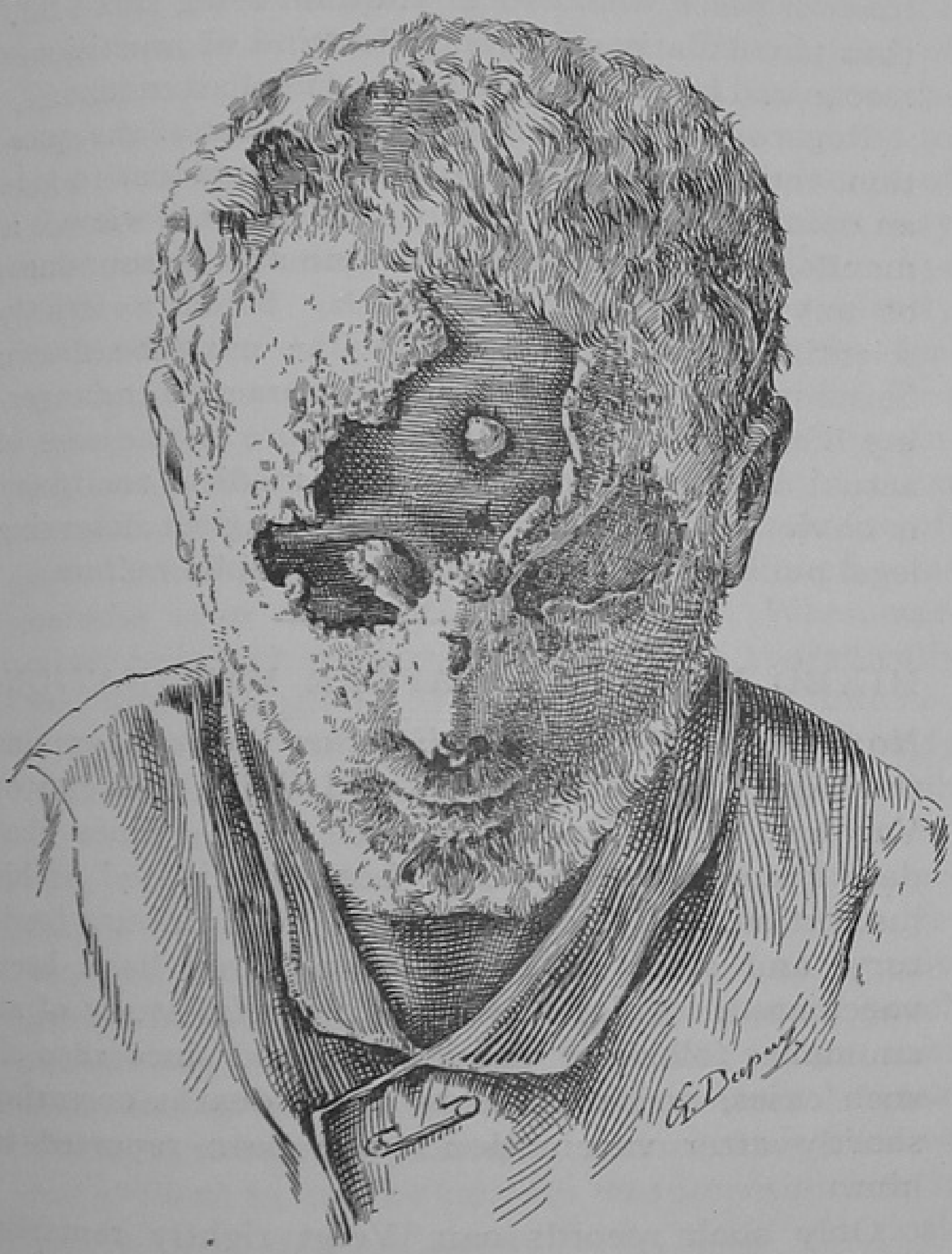
## EXTENSIVE BRAIN LOSS WITHOUT IMPAIRMENT OF INTELLECTUAL FACULTIES.

By WALTER KEATE, M.D.,
NACOZARI, SONORA, MEX.

The following are the details of an accident which occurred near here on May 18, 1903:

John G., a miner, aged forty years, was preparing to spring a hole with dynamite in which he had 6½ sticks of giant powder inserted. While he was arranging them they accidently exploded while his face was directly over the hole. I reached him two hours after the explosion. His pulse was 30 per minute, and very weak. The eyes were blown out, the skin and muscles and forehead were partly blown off, with the anterior portion of the skull cap turned back over the parietal bones. The orbital plate of the frontal bone, forming the roof of the orbit, was blown into the brain, and the brains exuded through the opening into the cheek. There was a hole in the frontal bone about the size of a silver ten-cent piece. The hole was located at about the center of the frontal bone, through which the brains exuded.



The membranes of the brain—dura mater, arachnoid, and pia mater—were badly lacerated, as were also the frontal lobes of the brain. The end of the nose was badly cut, the face and lips were badly burned with powder and literally filled with small rocks and dirt.

After trephining to make the opening a little larger, and to smoothe the ragged edges, I removed from the brain twenty small stones and several pieces of bone, together with considerable dirt Most of the foreign bodies were located at a point corresponding to the anterior fontanelle, deeply buried in the brain. A large piece of bone corresponding to the roof of the orbit was extracted from the brain through the opening in the forehead.

The amount of cerebral matter which came away weighed one ounce. It may sound incredible, but it is a fact that the patient has never for one moment been unconscious. His mind has been perfectly clear, and he can readily recognize his friends when they speak to him. He answers all questions intelligently, and describes accurately the details of the accident. He has never complained of pain, and says the anterior portion of the head feels paralyzed. His appetite is, and always has been, fairly good.

The first two weeks his temperature ranged between 100° and 103°, but the last two weeks it has been practically normal.

He has been able to get up every day since the accident, and locomotion is good. It has been just a month to-day, and as I write this article the patient is sitting in a rocker on the porch in the fresh air, chewing tobacco.

Both eyes are completely destroyed. The picture of the patient gives but a faint idea of how he really looks.

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## ECZEMA CURED BY MEASLES.

By G. W. SQUIRES, M.D.,
EAST AVON, N. Y.

Mark D., aged eighteen months, naturally born and healthy at birth, with the age of ten months became sadly afflicted with facial eczema. Except for some constipation and the eruption the child seemed perfectly healthy. Various kinds of medicines within and ointments and washes without were without effect. The exudation of serum was such that at night the pillow on which the child lay would be wet, and often when the crusts formed and cracked the child's hands, sheets, and pillows would be stained with blood. At this juncture, when the parents were despairing of a cure, an older brother contracted measles at school, came home, and had a hard attack. Much alarm was felt lest the baby should contract the measles and, with his already bad skin eruption, die. The baby, in due time after exposure, got very dangerously sick with the measles. He had fever and delirium and the skin was as red as a boiled lobster. In due time convalescence set in, and what was the surprise of physician and friends to see the eczema melt away like snow in the spring time, and every trace of the former eruption disappear, leaving the skin as soft and clean as a baby's can be. Now, after a year, there has never been the slightest symptom of a return of the facial eczema.

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**Thrombosis of the Femoral Veins Following Aseptic Laparotomy.**—E. R. Secard reports a case of operation for bilateral oblique inguinal hernia, which was carried out under the strictest aseptic precautions. Convalescence was uneventful, and the stitches were removed on the tenth day, primary union having occurred in the most satisfactory manner. Pain in the left groin, popliteal space and calf of the left leg began on the twelfth day, and a condition of extensive venous thrombosis set in. It ran a more or less benign course. It occurred on the side where the less extensive operation had been done, where there was less handling of the parts and less hemorrhage, but where a truss had been more or less constantly worn for twelve years. A study of this and other cases leads the author to the conclusions: (1) That no one etiological factor is alone responsible for the occurrence of this complication; (2) that the rate of infection in otherwise non-infective cases does not appear to be an important one; (3) conditions of sudden decrease of pressure dependent on the operation probably have a causative influence; (4) treatment should be prophylactic, as by avoidance of unnecessary traumatism, or hemorrhage, or of suddenly decreased tension, as by having the wound area well supported by firmly applied dressings. (5) So far as the author is aware there has been no mortality in the reported cases, but the occurrence of pulmonary embolism in a certain proportion warns us that this termination is not an impossible one.—*The Montreal Medical Journal.*

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## Original Articles.

### HIGH-FREQUENCY CURRENTS.*

By HENRY G. PIFFARD, M.D., LL.D.,
NEW YORK.

PROFESSOR (EMERITUS) OF DERMATOLOGY, NEW YORK UNIVERSITY; CONSULTING SURGEON CITY HOSPITAL; FELLOW NEW YORK ACADEMY OF SCIENCES, ETC.

If an electric current alternates or oscillates at a rate of a million times or more per second, it may with propriety be termed a "high-frequency" current. Such a current was introduced into practical medicine by Dr. William J. Morton in 1881.† It enjoyed a certain measure of vogue among those who employed static electricity in the treatment of disease, but its use was somewhat curtailed by the subsequent introduction by Dr. Morton of what is known as the "wave" current. This appeared to possess a wider field of usefulness than the earlier current to which the name Static or Franklinic induced current had been applied.

The brilliant experiments of Tesla with high power, high-frequency currents, induced D'Arsonval of Paris to study them carefully with a view to their utilization for therapeutic purposes. The result was the introduction of his high-frequency apparatus, the currents from which have been shown to produce very remarkable and very desirable results. It is to the currents from this apparatus with its various subsidiary appliances that the term "High-frequency" should be confined and is confined by all European authors.

I urge this, as high-frequency currents can be produced in various ways, but the currents themselves differ materially in character and can hardly be expected to produce exactly the same effects.

Three years ago I introduced still another high-frequency current, to which I gave the name "hyperstatic," in order to indicate its origin, and also to prevent its being confounded with the high-frequency current of D'Arsonval.‡

In order to make the matter clear I will indicate the manner in which these several currents are produced. To obtain the Morton "Static-induced" current you attach the leyden jars in the usual manner to a static machine. Then connect the patient to the outer armatures of the jars. Bring the sliding poles into contact and start the machine. Then separate the poles a short distance (say an eighth of an inch). The patient will now experience a slight sensation. If the spark-gap between the poles be increased to a quarter of an inch, distinct muscular contractions will take place, and if the gap be further increased the limit of the patient's endurance will soon be reached.

The D'Arsonval apparatus consists essentially of the following parts: (1) A good high-tension spark coil rated at eight or ten inches; (2) an efficient interrupter in the primary circuit; (3) Leyden jars or some other form of condenser of suitable capacity and (4) a solenoid. In other words, the simple addition of a solenoid to any *x*-ray outfit.

If the reader wishes to understand fully the D'Arsonval current let him connect the Leyden jars or other condenser to a static machine or coil. If now he takes a piece of wire and coils it helically so as to convert it into a solenoid, and attaches it to the outer coats of the jars with the electrodes attached to the same points and holds one in each hand, he will experience no sensation, but he must not deceive himself with the idea that there is "nothing doing," for if he will bring his hands close together, say within a quarter of an inch of each other, he will be promptly convinced to the contrary. This current which traverses the patient without giving rise to any special sensation is D'Arsonval's high-frequency current, and the only current to which, under this name, the European literature of the last ten years applies. It is only obtained when the patient is in a circuit *in shunt* to a suitable conductor connecting the external armatures of the condensers. It will be noted that there is *no spark gap* in the circuit of which the patient forms a part. The fact that a strong current passes through the body when in shunt to the solenoid may at first appear a matter of surprise, but it is due to the heavy impedance developed in the solenoid by the self-induction of the several coils of the solenoid on each other. In France an induction coil is universally employed in generating the D'Arsonval high-frequency current, probably because they have excellent coils in France, while their static machines are mere toys compared with those commonly used in this country. There is, however, a distinct difference between the high-frequency current from a coil and one from a good (American) static machine. The latter gives a current of higher voltage, but lower amperage.

D'Arsonval uses his high-frequency current direct from the solenoid, or in connection with two important subsidiary appliances. One of these is his condenser couch,§ which appears to me to be of but limited usefulness as compared with his large solenoid. This latter is about thirty inches in diameter and five or six feet high, large enough, in fact, to surround the patient without being in contact with him at any point. The terminals of the large solenoid are connected to those of the small solenoid, and the passing current induces a corresponding current in the body of the patient within the coil. Physiological experiments by D'Arsonval and others have shown that the current induced by the large solenoid notably increases the respiratory exchanges, the excretion of the urinary solids (including urea, uric, and phosphoric acids), the toxicity of the urine, and the radiation of heat from the body. In other words, there is a decided increase in the general metabolism, or as a French writer expresses it: "*Une suractivité plus grande des combustions organiques.*"

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*Read at a meeting of the Medical Society of the County of New York, September 28, 1903.

†Recent experiments by Dr. Manders (*Medical Electrology and Radiology*, July, 1903) appear to throw some doubt on this statement. According to this writer, the Morton arrangement gives rise to an interrupted, unidirectional current, and not to an alternating or oscillating one.

‡My hyperstatic transformer was at first made with the coarse wire inside the fine or secondary winding, the two being separated by modified form of the Tesla insulation. It was soon found better to reverse the arrangement, and to place the coarse winding outside the finer and using glass for dielectric. D'Arsonval also, in 1900, introduced his "Nouvelle bobine bipolaire," which involves a similar arrangement except that he depends on air instead of glass as the dielectric.

§A condenser couch can be readily arranged by taking a cheap examining table and laying a sheet of metal or wire gauze on the middle part. On this is spread two or three layers of cotton felt, over this again the thin mattresses or cushions that come with the table. The total expense need not exceed twenty-five dollars. Mr. Chisholm Williams has used the condenser couch with apparent benefit in the treatment of pulmonary tuberculosis.

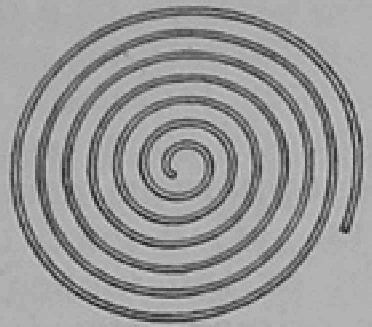

FIG. 1.—Spiral.

When we consider the large number of affections now recognized as depending on or accompanied by defective or retarded catabolism, the physiological data above given will readily indicate the therapeutic measures that may with confidence be pursued.

In 1893 Oudin of Paris connected his "resonator" to the D'Arsonval small solenoid, and in this way materially increased the potential of the current. Its chief use is in the local treatment of diseases of the skin.

My own hyperstatic transformer (MEDICAL RECORD, October 20, 1900) gives a high-frequency current, but it differs from the D'Arsonval current by its higher voltage. I have used this current only for the local modification of lesions and for its derivative effects. Whether it possesses any constitutional action or is capable of in any way modifying metabolism, I do not know. When I have desired to influence nutrition or to stimulate metabolism by means of high-tension currents I have availed myself either of static electricity pure and simple, or have used the D'Arsonval current.

The fact that an insensible current (*i.e.* one that cannot be felt) produces such sensible effects has as yet received no adequate explanation. The fact, however, remains, and a very ready and convenient means of demonstrating it, is to put an ordinary 16 c. p. 110 volt lamp in series with the human body, and passing the current derived from the small D'Arsonval solenoid. With a current of, say, six amperes traversing the primary of an eight-inch coil the filament of the lamp will immediately become of a bright cherry red, and without causing the slightest sensation in the person through whom the current is passing. This means a current of between two or three hundred miliamperes. If a direct current of equal strength were passing, the electrodes would cause an unbearable burning pain, while if an alternating current of low frequency (a few hundred alternations per second) were used, there would be intense tetanization of the muscles.*

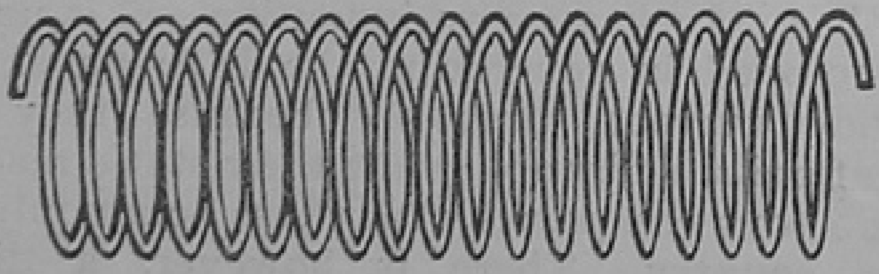

FIG. 2.—Solenoid.

Having used the D'Arsonval methods to a considerable extent, and having become thoroughly satisfied as to their potency in local lesions and their great value in improving the general metabolism, it yet seemed that some slight improvement might be made in the electrical technique, still preserving the essential D'Arsonval feature—that is, placing the patient in shunt to the current passing through the small solenoid. To this end I substituted a spiral† for a helix, and after many experiments with spirals of copper, brass, aluminum, iron, and steel finally found one that gave me results superior to those obtained with the D'Arsonval helix—the superiority being due to the fact that the self-induction and impedance was greater with the spiral than with the helix, and the shunt current consequently stronger.

The spiral that I have found most satisfactory is seven inches in diameter and nine inches and a half in height, including the base. When used with the static machine, place the largest jars in position and connect the terminals of the spiral with the outer coatings of the jars, with the electrode cords connected to the same points. The subsequent technique is that of D'Arsonval, which, briefly stated, consists in (1) applying both electrodes (metallic preferred) to the patient: (2) connecting one indifferent electrode (metallic) to the patient and bring a vacuum tube‡ near or in contact with the part that we desire to modify locally; (3) connecting one pole to D'Arsonval condenser-couch, the other pole being brought into contact with some part of the patient's body; (4) connecting the two poles with the terminals of D'Arsonval large solenoid or cage.

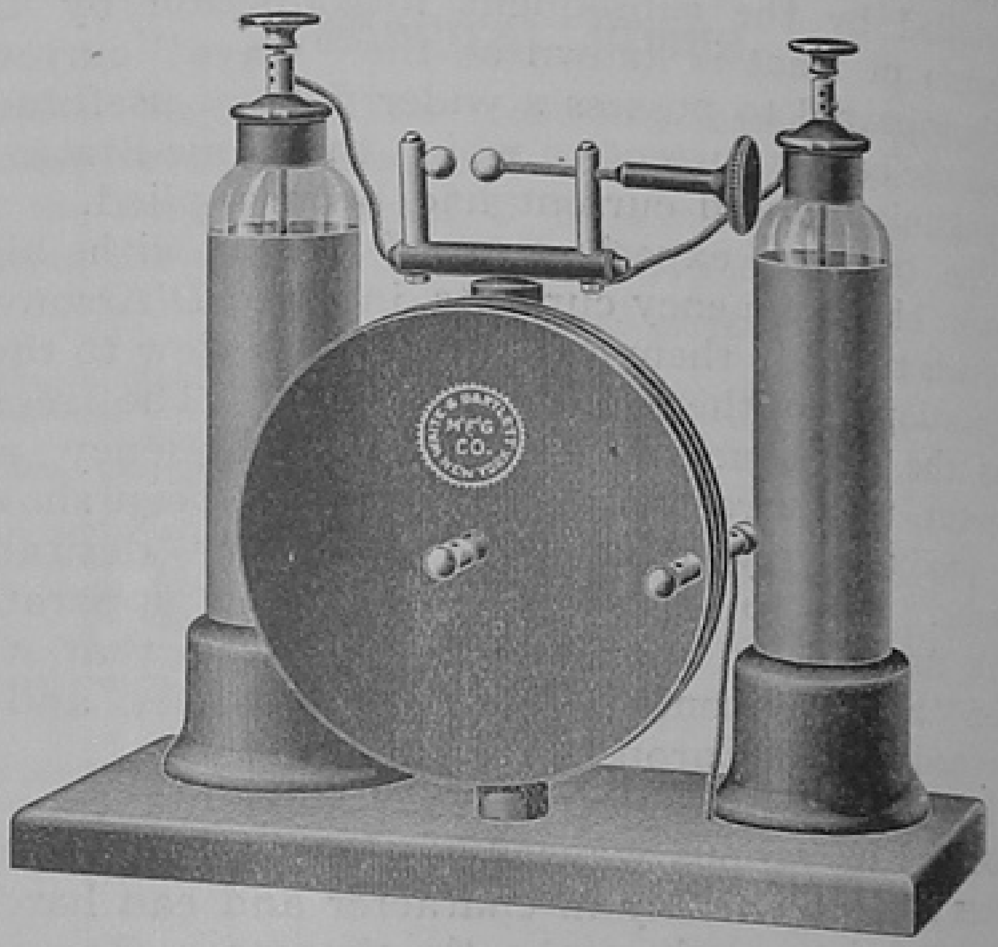

FIG. 3.—The author's high-frequency spiral for use with an *x*-ray coil.

If the spiral is to be used in connection with an *x*-ray coil *medium-sized* jars are mounted on the same base with the spiral, the terminals of which are already connected with the outer coatings of the jars. (Fig. 3.) The inner coatings of the jars are then connected to the terminals of the secondary coil, and the apparatus is brought into action with such spark-gap between the secondaries as may be found necessary. If two identical spirals are used one with a coil and the other with a static machine, the resulting shunt currents will not be identical—the former having the higher amperage and lower voltage.

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*The remarkable difference between the effects of low tension direct, and high-tension high-frequency alternating currents is well exemplified in the transmission of ocean messages. If a low-tension current is used, as from a large battery or dynamo, a metallic conductor traversing the sea must be employed. A high-frequency current, however, will flash the message over the ocean without the need of intermediate wires.

†A spiral is defined by the Standard Dictionary as follows: "Any plane curve formed by a point that moves around a fixed center and continually increases its distance from it." This is shown in Fig. 1. The solenoid or helicoidal employed by D'Arsonval is of the form shown in Fig. 2.

‡The use of vacuum tubes in connection with the therapeutic application of high-frequency currents is a purely American development, and the credit for their introduction belongs, I believe, to Dr. F. F. Strong of Boston. They are but little used or known in France or Germany, but have gained some favor in England.

The large solenoid of D'Arsonval is open at the top, but in the one I have had made for my own use the wire is continued in the form of a horizontal spiral, forming in this way a top to the cage. (Fig. 4.) It increases the auto-induction and adds to the efficiency of the apparatus. If a current of six or eight amperes be passed through the primary of the *x*-ray coil, the patient within the cage will experience but little sensation, although a powerful current is circulating through him. This will be readily demonstrated if he will hold the outer terminal of an Edison 16 c.p. 110 volt lamp between his finger and thumb, and touch the inner or central terminal to one of the upper wires of the cage. The carbon filament immediately becomes of a bright red. The spark-gap between the terminals of secondary of the coil need not exceed one-half of an inch. If longer than this the lamp will short circuit inside, or, as sometimes happens, the lamp filament will instantly flash to a full brilliance and then break.

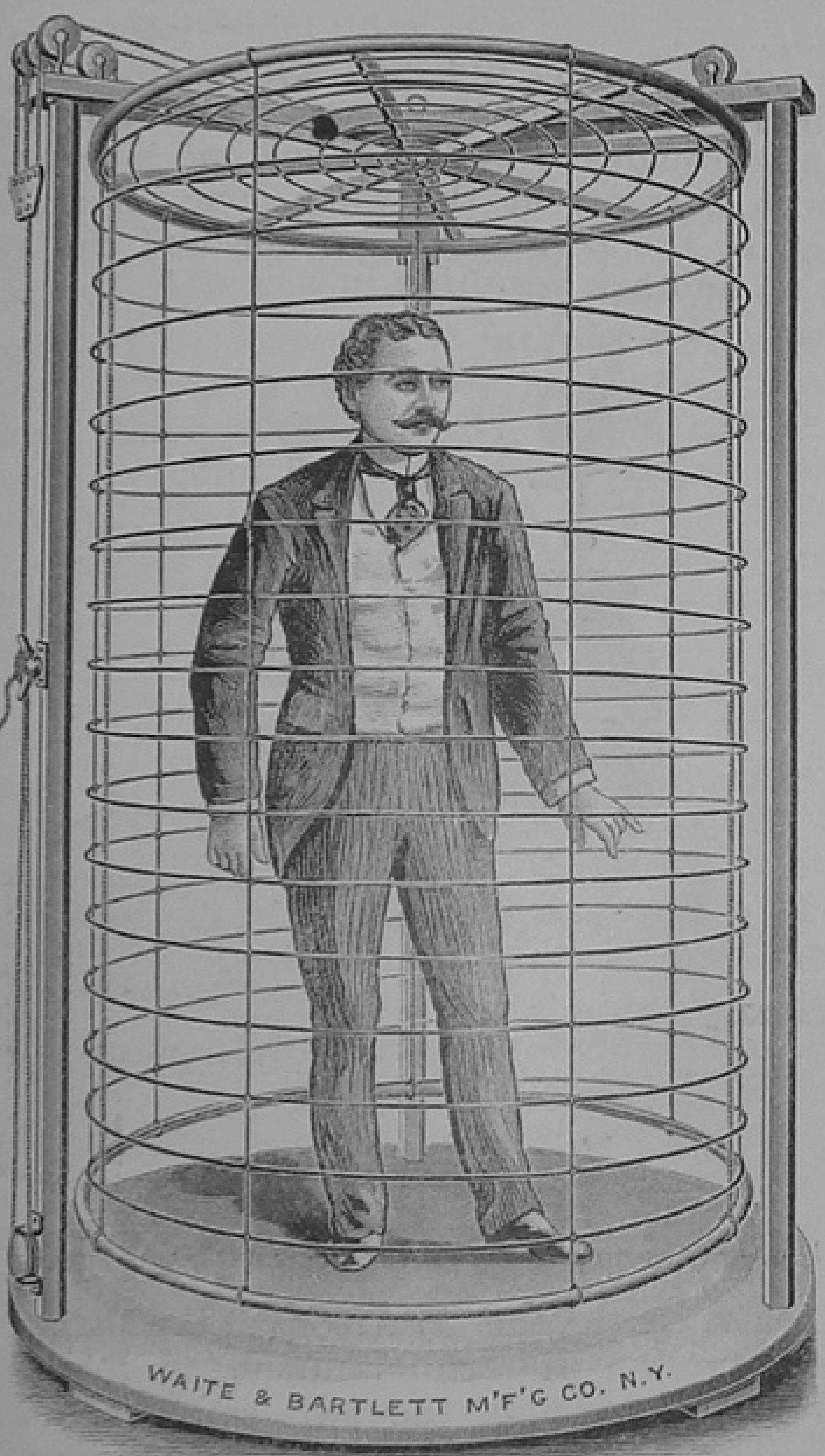
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FIG. 4.—The author's resonator or combined spiral and solenoid.

If, instead of connecting as above, one pole of the small solenoid or the author's small spiral be connected with the central terminal of the large flat spiral forming the roof of the cage, and the other pole to the point where the spiral joins the large solenoid, the induction effects are intensified as the arrangement now constitutes a large Resonator with the patient inside of it, instead of outside as with the Oudin. A still more intense effect is obtained if the small solenoid or spiral be omitted, and the outer and inner ends of the top spiral be connected directly to the outer armatures of the condenser (leyden jars). With the latter arrangement a longer spark-gap can be used. If connecting cords and electrodes are connected with any of the turns of the large coil, a regular D'Arsonval current with its secondary applications may be administered to one or more patients outside the solenoid, whether there is one within it or not; and this with but little apparent diminution of the intensity of the induced current within the cage.

I have not clinically used the large D'Arsonval solenoid in connection with a high-frequency current derived from a static machine, as my office arrangements will not conveniently permit of this combination. Experimentally it works in a satisfactory manner.

The very manifest difference between the wave-current of Morton and the high-frequency current of D'Arsonval immediately suggests the query as to the relative merits of the two in respect to their influence on metabolism. Clinical experience abundantly establishes the fact that both currents administered with care and judgment are capable of improving the various functional activities, including the respiratory, the thermogenic, and those relating to the conversion of ingesta into ejecta, be the same solid, fluid, or gaseous. The results of physiological experiment have shown the same in respect to the D'Arsonval currents, but I do not find that static electricity has been subjected to the same careful tests. Quite recently, however, some very careful and painstaking experiments with static electricity by MM. Maitre and Florence of Montpellier (*Archives d'Électricité Médicale*, April, 1903) have demonstrated that so far as the urinary secretion is concerned, the effects are similar in character but less in degree than those observed by D'Arsonval and others in connection with high-frequency currents. The machine employed consisted of two plates, capable of giving a spark of ten inches. It is to be regretted that the experimenters did not employ a more efficient apparatus. If this had been done it is quite possible that the metabolic results would have equalled, and perhaps surpassed, those obtained with the D'Arsonval system.*

It is now three years since I introduced the Hyperstatic Transformer for the local treatment of certain cutaneous lesions, and so far as I can learn the apparatus has given satisfaction to those who have used it. Some, however, I find do not appear to understand fully its capabilities or how to use it to

*One of the earliest static machines constructed in America for therapeutic purposes was copied, I believe, from one imported from France, and it is not a little surprising that the French have been so backward in the further development of this apparatus. The current advertisement of a somewhat prominent French manufacturer offers a "*Machine Statique a Grand Débit*," which consists of two pairs of plates twenty-two inches in diameter! A toy like this would not be seen in an American office, where it would be difficult to find a static machine with fewer than eight pairs of plates of thirty inches diameter. Static machines of the Wimshurst type are the ones commonly used in Europe, and in this type each pair of plates requires a separate belt. If a large number of plates are mounted it is almost impossible to secure uniform rapidity of rotation, which greatly impairs the efficiency of the machine. In this country the Wimshurst is not manufactured for therapeutic purposes, but the prevailing types are the Holtz and the Toepler-Holtz. The latter is self-exciting and proves attractive to some, on that account, as well as by reason of the lower price at which it can be manufactured, but the writer's experience with it is far from being as satisfactory as with the Holtz machine, which requires an independent exciter. If a Holtz and a Toepler-Holtz have equal areas of revolving surface, the output of current will be greater from the Holtz; when in action the Holtz machine will not change polarity, which the Toepler-Holtz is liable to do, especially when under a heavy load, when using the wave current or a high-resistance *x*-ray tube.

the best advantage. To these I offer the following suggestions:

Having connected the transformer to the static machine (with poles in contact), turn on the power, and when the plates are revolving at about 300 or 350 times a minute, separate the poles about an inch. If the hand be brought near one of the terminals of the transformer, it will be met by a diffuse electric spray (*effluve* of the French). The same will occur when the hand approaches the other terminal, but it will be noticed that the spray is more intense at one of the terminals than at the other, and it will be found that the stronger spray will be opposite the positive pole of the static machine. I usually connect the electrode with this terminal. If a very mild effect is desired the other terminal of the transformer is left free. If a stronger effect is desired the inactive terminal is grounded, and if still more action is required this terminal is connected with some part of the patient's person. The strength of the current may be further modified by using a longer or shorter spark-gap. After studying the effect of the spray the electrode should be brought nearer the skin, and when sufficiently near, bright sparks will shoot forth to be replaced by a multitude of fine sparks when the electrode is brought in direct contact with the skin. The best spray effect and also the strongest sparks are obtained when using an electrode with a metal point. The most generally useful electrodes, however, are glass vacuum tubes. I use a dozen or more of these, of shapes adapted to the particular requirements of the case. Some are of low and others are of comparatively high vacuum.

The transformer may be used with an *x*-ray coil by connecting it to the terminals of the secondary wire of the coil and adjusting the spark-gap of the coil so that the length of the spark shall be one-half inch or less. As the current delivered by the coil differs from that of the static machine (being of higher amperage and lower voltage), the current from the transformer will be somewhat modified. The spray will be shorter, more compact, and finer; while from the vacuum tubes the sparks are much finer and more numerous. On the whole, I find the current from the transformer connected with the static machine more effective than when connected with the coil. If the experiments are conducted in a darkened room the luminous effects are very striking.

As I have endeavored to make clear, the functions of the hyperstatic and the D'Arsonval currents are quite different and distinct—the former being chiefly useful for local applications while the latter is capable of distinctly influencing the general system.

Nearly thirty years ago the writer became fully satisfied that in the majority of cases of chronic eczema there co-existed a condition of the system characterized by defective elimination of catabolic products, and he so expressed himself as fully as the facts then appeared to warrant.*

From that time to the present I have found no good reason to question soundness of the views then put forth, although they have not been generally accepted by dermatologists, many of whom are inclined to attribute the phenomena that accompany eczema to a local pathogeny.

If we rely on drugs to facilitate the elimination of these "*materies morbi,*" or elements of autointoxication, we have at command diuretics, cathartics, diaphoretics, alkalies, and substances belonging to the salicylic group, but none of these has in my hands yielded results as satisfactory as may be obtained from high tension electricity, whether through the Morton wave or the D'Arsonval high-frequency currents.

When I have desired to obtain both the constitutional and local effects of high-tension electricity, I have until recently employed the wave or the D'Arsonval followed or preceded by the hyperstatic. This in many instances was tedious and time-consuming.

It then occurred to me to put binding-posts on the outside of the hyperstatic case and connect them with the terminals of the primary coil, leaving all other connections as before. If a patient be now introduced into this primary circuit he will receive the pure D'Arsonval current, and a 16 c. p. lamp placed in series will become incandescent. I could not obtain any evidence that the primary circuit was modified by the presence of the secondary winding, and what was still more important the hyperstatic current did not appear to be at all impaired by the simultaneous passage of the primary current through the body. Thus one is enabled to use both currents at the same time on the same subject, or the D'Arsonval on one and the hyperstatic on another, resulting in a considerable saving of time. (Fig. 5.)

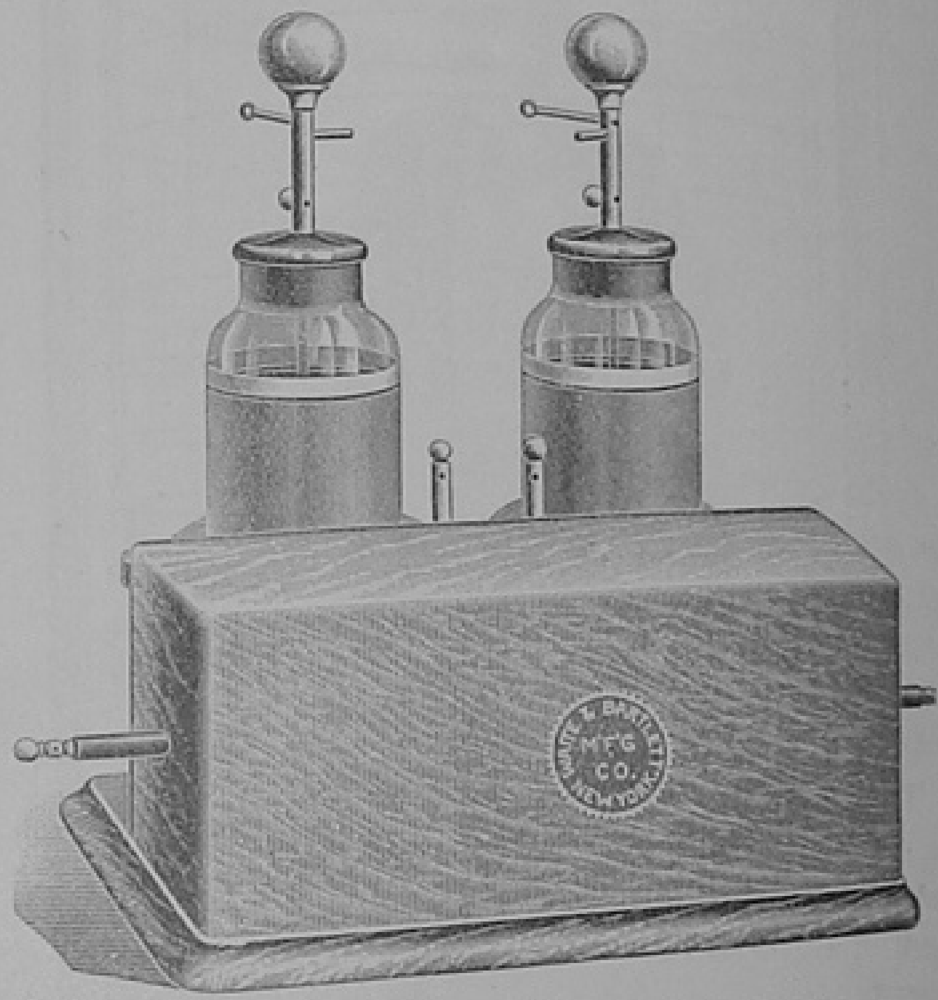

FIG. 5.—The author's improved hyperstatic transformer.

Although both the D'Arsonval and the wave currents exert a powerful influence on metabolism, the *modus operandi* of the two can hardly be the same. The first is a high-frequency current, the second is not. In the first the spark-gap will rarely exceed an inch, and in the second a gap of eight or ten inches is frequently employed. In the first there may be absolutely no sensation while the current is passing—in the second there is a vibratory sensation and the hair stands out from the scalp. After the passage of the D'Arsonval current for ten or fifteen minutes there may be but little change in the feelings of the patient—after the wave current there is generally a feeling of exhilaration and an apparent increase of energy. What changes then occur in the body during the passages of these currents, and in what way are their beneficial effects brought about? To these questions no certain answer can be given. In default of such, it seems reasonable to suppose that the wave current acts through a sort of molecular vibration or cellular massage, while the D'Arsonval may act through the development of heat in the tissues. A current that is capable of bringing the lamp filament to incandescence must of necessity develop more or less heat when traversing bodies that offer a similar high resistance to its passage.

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*"An Elementary Treatise on Diseases of the Skin," Macmillan & Co., London and New York, 1876.

The hasty sketch I have here given of the high-frequency currents is intended simply to attract attention to therapeutic agencies that I consider of high importance, and to encourage further research as to their general utility. The reader who desires to obtain a thorough working knowledge of the D'Arsonval current is earnestly advised to read Denoyés' "Les Courants de Haute Frequence," Paris, 1902; the chapter on "Hochfrequenzströme" (70 pages) contained in Freund's "Grundriss der gesammten Radiotherapie," Berlin, 1903; or Chisholm Williams' "High-frequency Currents in the Treatment of Some Diseases," London, 1903.

256 West Fifty-seventh Street.

# TWO NEW METHODS OF DETERMINING THE DIGESTIVE ACTIVITY OF GASTRIC JUICE.*

By HENRY WALD BETTMANN, M.D.,
AND
J. HENRY SCHROEDER, M.D.,
CINCINNATI, O.

Up to within recent years little attention was paid by clinicians to the digestive activity of gastric juice. During the past decade, however, a number of articles have appeared dealing with this subject. This increase of interest is due to two causes: First, several new methods have been devised which are seemingly simple and accurate enough for clinical purposes; second, it has been discovered that the digestive activity of gastric juice does not always run parallel with the secretion of HCl; or, in other words, that the quantity of pepsin secreted is often independent of the quantity of HCl, and is subject to independent fluctuations.

Some of the older methods of estimating pepsin are accurate, but all are too complicated for clinical purposes.† Only two methods have been used extensively for clinical purposes, those of Mette and Hammerschlag, and all recent work has been done with one of these methods.

The method of Mette, as originally published, is as follows:‡ "Fluid eggwhite is sucked up into a fine glass tube of 1 to 2 mm. lumen, and coagulated therein at a definite temperature (95° C.). The tube is then cut into small pieces, which are placed in 1 or 2 c.c. of the fluid to be investigated. The whole is kept in the thermostat at 37° C. to 38° C., and requires no further watching. Solution of the proteid occurs at the ends of the small glass tubes. After the termination of a certain period the length of the pieces of tube and that of the undigested remains of the proteid columns are measured off with the aid of a mm. scale and a microscope of low magnifying power. The difference gives the length of the digested proteid cylinders in mms. and fractions of a mm. This method leaves nothing to be desired so far as convenience of application and clearness with exactness of results are concerned. Test experiments specially carried out (Dr. Ssamojloff) have convinced us that the digestion of the proteid columns—at least within the first ten hours (employing the fluids which we have to deal with)—is directly proportionate to the length of the period. This was the case even when the fluid possessed its highest digesting power. These experiments did away with the very natural mistrust that the solution of the proteids may proceed at varying rates at different depths of the tubes, dependent on more or less stagnation of the digestive products within the lumen. It may, therefore be accepted that the length in mm. of eggwhite dissolved by the several juices in a certain time gives us an exact relative measure of the digestive power of the fluid. In the researches of Borissow carried out upon this question in the laboratory of Professor Tarchanoff, the relation which lies at the basis of the connection between the length of the digested column of eggwhite and the pepsin contents of the fluid under investigation came out with perfect clearness. The following is the rule which expresses it, viz., *The quantity of pepsin in the compared fluids is proportionate to the square of the rapidity of digestion, i. e.* to the square of the column (expressed in mm.) which the juices are capable of digesting in the same period of time. An example in figures will make this clear. If one of the fluids digests a column of 2 mm. of proteid, and the other a column of 3 mm., the relative quantity of pepsin in each is not expressed by the figures 2 and 3 respectively, but by the squares of these numbers, *i. e.* by 4 and 9. This rule has, of course, been deduced from comparisons made with numerous artificial solutions of pepsin exactly prepared. Moreover, the result which Dr. Borissow arrived at independently had already been discovered before him by Schütz from polarimetric observation of the amounts of peptone formed during the digestion of eggwhite. This correspondence in the data furnished by different methods affords strong assurance of the correctness of the rule. . . .

"We have still to add that the diameter of the tubes even within wide limits is without importance, and that the white of the hen's egg is of sufficiently constant composition to be employed as a test object for the purpose."

The method of Hammerschlag is carried out as follows: A c. 1 per cent. solution of egg albumen is prepared in the following way: 3.0 g. of albumen ovi sicc. is rubbed up with lukewarm water in a mortar, and then water is added to make the total quantity 150 to 180 c.c. This solution is filtered and officinal HCl is added until the solution contains 3 to 4 per cent. *free* HCl (as tested by titrating with $\frac{n}{10}$ KOH with dimethylamidoazobenzol as indicator). Ten c.c. of this acidified solution is now mixed with 5 c.c. of the gastric juice to be tested and another 10 c.c. is mixed with 5 c.c. of distilled water to serve as a control test. These mixtures are placed in two Esbach tubes, which they exactly fill up to the mark U, and are placed in the thermostat at body temperature for one hour. After one hour they are removed, and Esbach reagent is poured into the tubes up to the mark R. The tubes are inverted several times and then let stand twenty-four hours at ordinary room temperature. The sediment shows the amount of albumen present; in the control tube the original amount of albumen is shown in the other tube the albumen which has escaped digestion is shown. Thus the proportion of albumen digestion is easily estimated. Hammerschlag says that normal gastric juice digests 80 to 95 per cent. of the albumen in one hour.

Both methods have been used by a number of observers during the past ten years. The necessity for further and more critical work is shown by the variety of the conclusions reached. It is generally conceded that, for clinical purposes,

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*Paper read at the sixth annual meeting of the American Gastroenterological Society at Washington.

†A history of these methods is given by Schorlemmer and by Van Valzah-Nisbet.

‡This description is copied verbatim from Thompson's translation from Pawlow, "The Work of the Digestive Glands."

## Radium as a Therapeutic Agent.

The discovery of radium may almost be said to mark an epoch in the history of science. The limit of its potentiality is as yet not nearly known, but the knowledge already gained of its properties clearly distinguish this mineral as in a measure standing apart; and it has been asserted that radium will open up a new field of scientific investigation, perhaps even lead to the isolation of a new group of elements. At the meeting of the New York Academy of Sciences, held recently, radium and the phenomena of radioactivity displayed by the mineral were considered, and a comparison was made between its powers and those of ultraviolet and Röntgen rays. George F. Kunz read a paper on the action of the Röntgen rays, ultraviolet rays, and radium on mineral substances, in one of the lecture rooms of the Natural History Museum. Mr. Kunz also touched briefly on the probable uses of radium in medicine. He said in part: "The invention of Goerl, which has been perfected under the name of the Piffard lamp in the United States by Dr. Henry G. Piffard of New York, is an instrument of great utility, as he has proved it a valuable medical adjunct. This brings to mind a possibility of the utmost importance. There is the possibility that fluorescent substances can be injected into the veins, intestines, etc., or it might be taken in powders or in solution in food, and thus a nearer location effected in organs desired to be examined. The entire tissue structure could then be examined, as well as the bony structure is at present by the Röntgen rays, under the ultraviolet rays." These, however, are but forecasts of what may happen. Some practical work has been done by means of radium. Mr. Mackenzie Davidson of London and Professor Gussenbauer of Vienna have had very successful results in the treatment of rodent cancer by the application of the rays from radium. Mr. Frederick Soddy of University College, London, has suggested a method of applying the rays from radium and thorium in the treatment of consumption. Mr. John Macintyre, surgeon for diseases of the throat and nose, Glasgow Royal Infirmary, contributed an article to the *British Medical Journal* of July 25, in which the therapeutic effects of the salts of radium—so far as is yet known—are well described. He thinks that the study of radium is evidently going to throw a considerable amount of light upon questions hitherto obscure in the region of physics, and it is not altogether improbable that the same thing may be said of it in medicine. According to Mr. Macintyre, three kinds of rays have been already distinguished: (*a*) Infinitely small positively charged atoms of matter flying at great speed, which can be measured, and the result seen by the bombardment on zinc sulphide screens; (*b*) rays which seemingly correspond to the cathodic rays in a Crookes's tube, and also described by Leonard as passing through an aluminum window in the same, and (*c*) rays which evidently correspond to the *x*-rays. The author then gives an account of some cases of lupus and rodent ulcer which yielded to treatment by the salts of radium, and concludes as follows: "A considerable time must yet elapse ere any opinion can be offered about the true value of radium compounds in the treatment of such cases. Even if its therapeutic value be thoroughly established, there will remain the questions of the time taken to produce the desired effect, the kind of cicatrix or covering which forms, and, last, but not least, to what extent they are likely to compete with the *x*-rays, high frequency, or other forces."

Radium, as a therapeutic remedy, is on its trial. There is the possibility, perhaps almost the likelihood, that it may eventually become of inestimable value in medicine, but at present sufficient is not known of its properties to pass a decided opinion. It is in the potential stage, but may emerge now at any time into an actual medical remedy of surpassing merit.

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## The Checking of Tuberculosis in New York.

Under the heading "The White Plague in New York," the *New York Evening Post*, October 17, gives an excellent sketch of the conditions with regard to consumption which prevail in the city, as well as a history of the disease, the measures which have been put into force to check its spread, and offers suggestions as to the best means of conducting a successful crusade against its inroads. So much has been written and said concerning consumption within the past few years, that it may seem somewhat supererogatory to again bring up the matter. On the principle, however, that "Continual dropping will wear away a stone," so may a persistent ventilation of the subject arouse the apathy of the general public with respect to the menace of tuberculosis. In the past ten years the deaths from various forms of tuberculosis in the Boroughs of Manhattan and The Bronx, have, it is said, averaged about six thousand annually, the great majority being due to pulmonary tuberculosis. This statement alone should be sufficient to excite the alarm of the citizens of New York and to arouse them to resolute action with a view to altering the present condition of affairs. The article in the *Evening Post* expains the indifference of the public as due to the fact that for generations people have been taught to believe that consumption was hereditary, and, when once contracted, incurable; that a certain large portion of each community had always been afflicted with this scourge and always would be; that those who were predestined to contract it would do so, and there wasn't much use in doing anything to prevent it.

Whatever may be the reasons for the disregard with which the ordinary individual regards consumption, one thing would seem to be certain, that if any headway is to be made against the spread of the disease, strict preventive measures must be taken, and that if the inhabitants of a city do not know enough to protect themselves they must be protected against themselves. In the first instance, every effort should be put forth to educate the public as to the nature and best methods of treatment of tuberculosis. At the same time the municipalities of large cities would do well to take immediate steps in the direction of preventive measures.

With perhaps some reservations, the language of the writer in the *Evening Post* in describing the methods most fitting to the situation, meets the circumstances of the case. He writes as follows: "In conducting a campaign against this destroyer of human life in a great city like New York two things are necessary for success. First, the education of the people in regard to the true nature of tuberculosis. Teach the masses that it is not a loathsome, secret, incurable disease reflecting disgrace or discredit upon the individual or his family, but an infectious, communicable disease produced by a germ which is universal, and that it is quite readily curable if taken in time. Inform them that the source of infection is the sputum cast off by the patient, and consequently, of the great responsibility which rests upon each individual to destroy the germs in the expectoration before they can become a source of danger to others. Secondly, a proper provision in the way of hospitals and sanaonce or twice during the night, has no vesical catarrh, or, just a trace of it, and if the residual urine does not exceed 60 c.c. = 2 ounces, I call this, with others, a cure.

12. Two cases need re-examination, having been operated upon in November and December, respectively, 1902.

13. *Bulletin of the Johns Hopkins Hospital*, 1902, Vol. XIII., page 36.

14. *Annals of Surgery*, July, 1902.

700 MADISON AVENUE.

# THE RÖNTGEN AND FINSEN RAYS; ELECTROLYSIS; GALVANISM; FARADISM; HIGH-TENSION DISCHARGES, AND DIAGNOSTIC ILLUMINATION.

## DESCRIPTION OF A PRACTICAL OFFICE OUTFIT FOR THE GENERAL SURGEON.

By SINCLAIR TOUSEY, A.M., M.D.,
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THE author's outfit is suitable for use wherever the ordinary electric house-lighting is installed, and, in fact, can be carried from one house to another and connected with the current by simply removing one of the incandescent lamps and screwing in a plug instead. The weight of the apparatus, however, is such that it would take an express wagon to carry it, so that, except in very unusual cases, it is only for office use. In many small towns where there is no regular electric lighting system the current may be introduced into the doctor's office from the trolley system of street cars.

The first step in the installation of this outfit is the introduction of the current into the house. The electric company tears up the street, and brings three main wires into the cellar. These (one negative and two positive) are broken by a main switch having three arms, and when this is turned off the wires and apparatus in the house are entirely devoid of electricity. In the same fire-proof box with this switch the main wires are each interrupted by a fuse. This is a short piece of lead wire through which the current has to pass, and which will not transmit a current of more than twenty-five amperes or more than two hundred and twenty volts. The fuses are permanently in position, not turned off or on by the switch, and insure the apparatus in the house against excessive currents which might burn out a hundred dollars worth of wire in an instant; but in this way just burn out this fuse, costing a few cents, and stop right there. Of course you are cut off from the current until a new fuse is put in.

The current I use is the one hundred and ten volts, direct current, but the electrical manufacturers can construct the apparatus for use in connection with the one hundred and ten volts alternating current.

From the main-switch the wires pass through a meter, which in my case is the property of the New York Edison Company, and serves as the basis for their monthly bill for current used. Then the wires are interrupted again by three enclosed fuses which burn out with a current of ten amperes and two hundred and fifty volts. Beyond this the three wires are of very heavy copper, thoroughly insulated. Where they pass through floors they are enclosed in porcelain tubes, and where they pass through long spaces in walls they are enclosed in the spiral metal tubing called "flexible conduit." Wherever passing along the surface, they are enclosed in molding, and, of course, asbestos paint is used on this.

The "wiring" terminates in the doctor's office in two different lines, each of which is controlled by a switch of the capacity of ten amperes and two hundred and twenty volts.

Beyond this switch on each line is a regular electric-light socket, into which screws a plug at the end of the flexible insulated wires leading to the different pieces of apparatus.

The first to be described is the *x*-ray outfit. This consists of a liquid interrupter, a Ruhmkorff coil, a rheostat with pole-changer and an *x*-ray tube and stand.

The positive wire passes from one of the wall sockets to the interrupter. This consists of a large porcelain jar, partly filled with dilute sulphuric acid, in which is set a smaller jar with a pinhole orifice near the bottom, also containing dilute sulphuric acid. One conducting wire terminates in a leaden ring resting in the acid in the outer jar. The current passes through the liquid and the punctured jar to a leaden plate resting in the acid in the inner jar, from which it passes by a conducting wire to the rheostat and then through the primary coil and thence back through the negative wire to the wall-socket. The principle of this particular interrupter is that when the current begins to flow, bubbles of oxygen gas are liberated from the dilute acid by electrolysis and collect at the negative electrode and bubbles of oxygen gas form at the positive electrode. These are in sufficient amount to check almost completely the passage of the current, and the instant the current ceases the bubbles of gas rise to the surface and the current flows again with full force; and again bubbles of gas interrupt it.

These interruptions take place at the rate of about eight thousand per minute, and are for the same purpose as the little vibrator in the "home medical batteries"—that is, to cause a rapid succession of currents in the same direction through the primary coil, each of which produces by induction a current of vastly greater intensity or voltage in the secondary coil. When a mechanical interrupter or "buzzer," is used for an apparatus of this power, however, a separate electric motor is required of such a size as to shake the whole floor, and the sparks which fly about are of quite a terrifying nature. The absence of noise and jarring and danger from fire are the great advantages of a liquid interrupter, and then again it is more rapid. The author's gives all the way up to twelve thousand interruptions a minute. The care required to keep such a liquid interrupter in working order is simply to pour a glass or two of water into the outer and inner jars every few weeks, while with a mechanical interrupter one may frequently have to spend an hour in adjusting the vibrator.

The next part of the apparatus is the Ruhmkorff coil, and this consists of a primary coil of copper wire wound around a soft iron armature, and surrounded by a secondary coil made up of about a hundred thousand feet, about twenty-miles of insulated copper wire. This wire is one thirty-sixth of an inch in diameter and comes already wound with silk and is coated with melted paraffin as it is wound; disks of hard rubber separate it into several sections and lessen the probability of the coil burning out when the current is turned on full. The coil is the important part of the whole apparatus, and everything depends on the perfection and permanence of the insulation. The author had three different coils made by various makers before obtaining one that was satisfactory.

The secondary coil terminates in two poles about eleven inches apart. Each of these consists of a brass base about two inches high. A hard rubber section about two and a half inches high, and a brass top with a binding post. From the two bases project steel points with insulated handles, and these can be placed at any angle. When they are horizontal they come within an inch and a half of meeting in the middle, and when nearly vertical they transmit the current to the wires going to the *x*-ray tube, with or without a spark-gap, depending upon whether the points are in contact with the wires or not. In my own experience spark-gaps have proved essential to good *x*-ray work, and this, of course, is the object of having the posts broken by the hard rubber section instead of being continuously of metal. The sparks passing from the points to the wire are so powerful that the wire used to melt every once in a while, so I have permanently attached a short piece of heavy iron wire to each binding-post, and the conducting wires are simply hooked on to these. The sparks pass harmlessly from the points to the heavy iron wire. The connecting wires are spiral steel springs without insulation. These are infinitely more convenient than insulated copper wire, which, even if coiled into a spiral, requires the *x*-ray tube to be at just such a distance from the Ruhmkorff coil. With the springs the tube can be carried backward or forward and raised and lowered and turned about in every way without paying any attention to the wires. They take care of themselves.

The *x*-ray tube is a hollow sphere, about eighteen inches in circumference, with a cylindrical prolongation extending downward for about six inches. Through the sealed end of this passes the cathode, terminating in a concave mirror of aluminum just where the cylindrical part joins the spherical part of the tube. Above, there are two cylindrical projections, through one of which passes one anode, called the anticathode, terminating in a disk of aluminum just where the cylinder joins the sphere. The anticathode and the cathode are, so to speak, at opposite ends of the tube. The other anode enters the tube obliquely through a cylinder and terminates at the center of the spherical part of the tube in a disk or mirror of platinum. This mirror is at the exact focus of the concave mirror forming the cathode. The whole tube is hermetically sealed and contains a partial vacuum.

When in use, a direct current of very high voltage and very rapidly interrupted is driven from the cathode to the anodes through this partial vacuum, and the molecules of gas are projected from the concave cathodal mirror to the plane platinum anodal mirror, from which they are diffused in such a way that the whole hemisphere in front of the mirror is filled with a greenish light. This light is not the *x*-ray, but is present with it, and to the experienced eye is a perfect guide to the quality and intensity of the *x*-ray. The latter, of course, is invisible to the naked eye. If the hand be held up before the *x*-ray tube in operation, no special effect is noted. If you were in a dark room and the *x*-ray tube in operation were encased in cardboard, no light would be visible. But the invisible *x*-ray would penetrate the cardboard and would cause a bright green fluorescence in any surface coated with certain chemical substances, most commonly barium compounds. In such a darkened room you could hold your hand toward the place where the *x*-ray tube is known to be concealed, and hold a piece of cardboard, coated with such a chemical between your hand and your eyes, with the prepared surface toward you, and then you would notice a bright green fluorescence in the cardboard, shaded more or less by the rays having to pass through the bones and soft parts of the hand. It seems exactly as if you were looking at the bones and flesh through a more or less transparent medium, but what you really see is a shadow upon the fluorescent surface. A piece of cardboard prepared in such a way is called a fluoroscope, and if it is turned with the chemical surface away from the observer you see nothing at all. The idea is that the invisible *x*-rays will pass through almost any substance and excite fluorescence in certain chemicals. This fluorescence is ordinary light, and to see it you must have it exposed directly to view. For every-day use the fluoroscope forms the bottom of a dark box which can be applied to the eyes in such a way as to exclude all ordinary light. The chemical surface is toward the eyes, and when the apparatus is held up toward the *x*-ray tube the bottom is so brightly fluorescent as to seem transparent. Especially is this the case when some object like the hand is held between the *x*-ray tube and the fluoroscope.

The bones and all are so clearly seen that several times people have expressed surprise when they discovered later that they were not looking through a piece of glass, but through a heavy sheet of black cardboard. Using this apparatus, the room does not have to be darkened, though I think that slightly better results are obtained if it is dark. The *x*-ray appears to be interfered with to some extent by the presence of ordinary light waves. This fluoroscope is easily held in one hand, and with it we can at once see the condition of the bones and joints in any of the limbs, the condition of the ribs, clavicle, scapula, vertebræ, lungs, heart, liver and spleen. The fluoroscope hardly gives us a useful view of the pelvis or the hip-joint. The spleen and liver can be seen clearly enough, and abnormal size or lessened mobility during respiration are easy to demonstrate. The size, shape, and position of the heart are seen, and the density of the lungs is noted.

The *x*-ray tube is held in any required position by a stand consisting of a heavy iron base, with an iron upright, from which extends a wooden arm. The tube itself is provided with a separate prolongation by means of which the degree of vacuum is regulated. A tube which is "hard," *i. e.* in which the vacuum is very high and the gaseous contents are almost completely exhausted, as by overheating, shows greenish spots over the unlighted hemisphere, and the line between this hemisphere and the bright one is not sharply defined. A "hard" tube produces a light of great penetrating power, and is desirable for fluoroscopic examination through great thickness of tissue; but is not so desirable for fluoroscopic examination or photography of the bones of the hand or forearm. These bones look transparent and do not present the beautiful contrast which they do when examined with a "soft" tube.

Like every other scientific means of observation, a great deal more is seen by the practised eye than by one unaccustomed to this work, and especially is this the case here because a long study of the image is prohibited by the danger of an *x*-ray burn. Right here comes in the value of an *x*-ray photograph, which shows everything that can be seen with the fluoroscope and which can be studied and demonstrated as carefully and for as long a time as necessary.

The author is about to publish a description of a new process by which an *x*-ray photograph may be made and handed about the room in five minutes and fifteen seconds after the patient comes into his office.

Quite another portion of the outfit is a set of vacuum-electrodes for the high-tension discharge. Each of these is a vacuum-tube of a size and shape corresponding to the part to which it is to be applied. One has a flattened, bulbous extremity, and is applied to the surface of the body; and others are of special shapes for introduction into the bladder, rectum, vagina, nose, and ear. Such a tube is held by an insulated handle, and is connected with one pole of the Ruhmkorff coil, the rheostat being turned quite low. There is no connection with the other pole of the coil.

When the current is turned on, this tube becomes filled with waves of faint light, which apparently enter the body where the tube touches it. If the tube is held at a little distance from the body a shower of sparks passes from the tube to the body, and this is more or less disagreeable, according to the sensitiveness of the skin. This portion of the outfit is purely for therapeutic purposes, and the author has obtained extraordinary results in infantile paralysis, rheumatism, sciatica, lumbago, and especially in chronic colitis and impotence. For most purposes it is better to have the tube in contact with the surface, and then scarcely any sensation is perceptible and absolutely no disagreeable effects.

The portion of the outfit used for the production of the Finsen or ultraviolet ray consists of a Görl lamp as modified by Dr. Piffard, and described by him in a recent article, and a medium-sized Leyden jar. The whole being connected with the *x*-ray coil. The outer surface of the Leyden-jar is connected with one pole of the coil, and the inner surface with the other pole, no spark-gaps being used at either connection. The Leyden-jar acts as a condenser, and is absolutely necessary to the production of the ultraviolet ray. To the two poles of the coil are also attached the insulated wires leading to the Görl lamp. This connection with the coil is also without spark-gaps. The Görl lamp itself is easily handled, and consists of a hard rubber cylinder, at one end of which enter the insulated wires from the coil. These terminate in two brass knobs at the other end, between which are two others; the whole producing three spark-gaps. This end of the lamp is covered in by a lens of quartz-crystal which is transparent to the ultraviolet ray. When in use these sparks give out a noise like a package of firecrackers and the light has a faint, violet color

The presence of the ultraviolet ray in the light from this lamp is demonstrated by the beautiful green fluorescence produced in a piece of willemite, an ordinary looking rock, consisting of silicate of zinc. This fluorescence is prevented by the interposition of a piece of glass or of a piece of the thinnest tissue paper. And this is in very marked contrast to the *x*-ray, which will penetrate the thickest book. The ultraviolet ray is present in very small amount in sunlight, and its presence may be demonstrated beyond the violet end of the spectrum. Of course it is invisible. Originally it was obtained for curative purposes from sunlight by means of lenses concentrating all the rays and a layer of water or rock-salt to absorb the heat rays. Its production from electricity in various ways marks a very great advance.

Therapeutically the ultraviolet ray is limited to action upon the external surface of the body, and if it is to penetrate even the thickness of the skin, as in lupus, we must press the blood, which is opaque to these rays, out of the part, and this is one reason for having the quartz crystal covering the end of the lamp. This can be pressed firmly against the surface. Or, again, the part may be blanched by the application of adrenalin chloride. This will be absorbed all right by a raw surface or a mucous surface, but to blanch the unbroken skin we have to follow Dr. Piffard's suggestion and introduce the adrenalin chloride by electrolysis. The conditions which are benefited by it are especially lupus, and acne, eczema, epithelioma, and chronic ulceration.

One of the standard tables giving a variety of positions gynecological and otherwise, is a necessity for treatment by the *x*-ray and by the vacuum electrodes. Therapeutically the *x*-ray proper is invaluable in inoperable malignant disease and in acne, lupus, psoriasis, nævus, and colitis.

The final portion to be described is a portable switch-board connecting with the electric light service and containing rheostats and converters of various kinds, and a milliamperemeter. This gives all the varieties of galvanic and faradic electricity required for ordinary therapeusis and for electrolysis and for diagnostic illumination. This is contained in a box measuring about eight by eight by thirteen inches, and is connected with the wall socket by means of a flexible cord and plug. The various accessories, such as the urethroscope, sponge-electrodes and electrolytic needles require no description. This part of the apparatus can be taken to any house where there is electric light.

The cost of electric current for such an outfit is very small. Not more than five or ten cents an hour for *x*-ray and vacuum-tube work, and next to nothing for galvanic and faradic work. The apparatus is always in working order day and night, dry or damp weather, and has great advantages over a static machine in therapeutic uses.

103 West Seventy-sixth Street.

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# THE CHOICE OF METHOD FOR THE RELIEF OF RETROVERSION AND RETROFLEXION*

By JOHN VAN DOREN YOUNG, M.D.,
NEW YORK.

A MULTIPLICITY of methods in use for the relief of any condition of deformity or disease of the human body usually means that none of them is satisfactory, or that the principles governing the employment of the various useful procedures have not been understood clearly, and have given rise to a feeling of dissatisfaction on the part of the operator, and an effort to devise a new operation has been the result.

It is my feeling that the latter has been the case in dealing with retroversion, and retroflexion of the uterus. Each individual operator has employed some method, found it lacking, and becoming imbued with a belief in the great benefit of some other procedure, has gone to the extreme of thinking that because there was a retroversion or retroflexion, this method would relieve it, instead of recognizing that the condition was a complex one, and involved many structures, and any method of procedure must be in accord with the condition he sought to relieve.

My desire is to point out the factors that should govern us in choosing one of the recognized methods of treatment; and my deductions are founded on eleven years of clinical experience, during which I have had the opportunity to observe the results of treatment as applied by many gynecologists and general surgeons, long after they have lost sight of the cases, and on my own operative and non-operative cases and the literature on the subject.

I am free to say that my clinical experience has led me to be much more conservative as to the ultimate results in the relief of symptoms than one would think necessary when reading papers on new operations.

I shall not burden you with the report of many cases, or quotations at large, from a very voluminous literature, but will first ask your attention to the conditions found in a normal female pelvis:

*Read before the New York Obstetrical Society.

Medical Record

*A Weekly Journal of Medicine and Surgery*

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Whole No. 1707.

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## Original Articles.

# SOME CASES TREATED BY THE *X*-RAY.

### FACIAL CANCER, CARBUNCLE, CHELOID, ACNE, ALOPECIA AREATA, SYCHOSIS, FIBROID TUMOR, PSORIASIS, AND LUPUS.

By WILLIAM JAMES MORTON, M.D.,
NEW YORK.

Case I.—Carcinoma of the left orbital region; inoperable. George Van A., aged sixty-three years, Jamesburg, N. Y. June 24, 1902. (See Figs. 1 and 2.) The disease began about fifteen years ago as an apparent mole on the cheek, below the lower canthus of the left eye. During ten years this mole-like growth laid fairly dormant, and then broke down into an ulcer with the formation of scabs. The ulcer increased in size until two years ago it was about one-half an inch in diameter and quite deep. It was now treated by a cancer paste, and apparently healed in about a month. But soon hard nodules formed around the edges and quickly broke down into an excavation larger than ever before, and discharged much pus. The bone of the orbit now became involved. In November, 1902, the paste was again applied, but the disease still continued to spread angrily in every direction.

He then took the Alexander treatment of about thirty-seven injections, but with no benefit; on the contrary, the disease has spread rapidly until it presents the appearance shown in the accompanying illustration. (Fig. 1.)

Present appearance: Both the upper and lower eyelids are more than half destroyed, both presenting at the junction of the diseased with the normal tissue a raised and indurated edge. The orbital socket presents a deep excavation; the raised and indurated edges of the ulcer extend outwardly beyond the orbital ridge, forming altogether an ulcer about one and one-half inches in diameter. Beyond the ulcer, extending on to the temple outwardly, is a mass of hard nodulated tissue about two inches in area, and feeling as if it were bone. The ulcer has an angry appearance, and discharges pus freely.

Since the patient had already lost the sight of the right eye by an accident, he was extremely anxious about a possible injury to the sight of the sound eye, and his anxiety led to a mild and discreet use of the *x*-ray.

Treatments were begun June 4, and continued three times weekly until August 22; time of exposure, fifteen minutes; distance of ulcer from target, nine inches; medium strength *x*-ray from a hard tube, showing plainly in the fluoroscope double bones at the wrist at a distance of two feet; a lead mask as usual; fifteen inch Ruhmkorff coil, mercury jet interrupter. In twenty days the nodules were visibly diminished in size and the ulcer was evidently almost healed (Fig. 2), and treatment might have stopped at this time except for the anxiety of the patient to make sure of a cure. In all, thirty-two treatments were given, extending over a period of eighty days.

It is interesting to note that this ulceration has not, apparently, healed by the usual process of cicatrization, for there exists not the slightest trace of contraction. The upper eyelid presents now a normal appearance, and the lower is new skin, but not scar tissue.

On January 31 the patient returned for precautionary treatment of a small point about the size of the head of a pin, and a photograph taken to-day would present even a better appearance than the one here reproduced.

Case II.—July 2, 1902. Wm. L., aged fifty-two years, Astoria, L. I. Cutaneous carcinoma on both cheeks. Patient referred by Dr. Walter Eyre Lambert. Disease began one and one-half years ago as a small pimple on the right cheek just below the eye. Scabs formed and dropped off frequently. Soon an ulcer formed about one inch in diameter.

Treatment began July 2 and continued three times weekly up to thirteen treatments. About the eighth treatment, the ulcer showed signs of healing; it grew smaller and smaller, and ceased to form scabs and was perfectly healed in five weeks.

About one year ago a similar growth appeared on the left cheek one-half inch below the left eye. The growth was at first a round and hard lump the size of a pea. Six treatments, three times weekly, caused the ulcer to heal entirely.

Patient again examined October 17, and the skin appears to be sound. There is no sign of cicatricial tissue and no scar, nor can the site of the ulcers be found by examination.

Case III.—October 10, 1903. M. W., aged eighty years. Epithelioma of nose. (See Figs. 3 and 4.) Existent since two years. Treated constantly by experts and no progress toward cure made. The ulcer is a deep hole with irregular, indurated, and rounded edges surrounded by a reddish areola. A scab forms continuously over the ulcer. The entire bridge of the nose is involved and a perforation of the bone and an opening into the inside of the nose has occurred.

The swelling, redness, and scab disappeared after twelve treatments, say at the end of six weeks. At the end of three months (with altogether twenty-four treatments) the epithelioma appears to be completely cured.

A perforation of small caliber from the outside to the inside of the nose remains as a result of tissue already destroyed by the cancer. The imperfections of the photograph of Figure 3 are largely due to senile tremor.

Case IV.—April 25, 1902. B. H., aged sixty-two years. Epithelioma of lower lip. Referred by Dr. Am Ende.

Disease began fourteen years ago on the under lip as a hard, defined area. At the time of beginning treatment, the lip presented a most grievous and "ugly" appearance. The disease had invaded the entire length of the lower lip, precluding any reasonable operation by the knife. Roughly speaking, the lip looked to be very much swollen and projected forward. It was of a dark purplish to the cancer. Patient suffered much pain.

Treatment: *X*-ray, shield for upper lip and face.

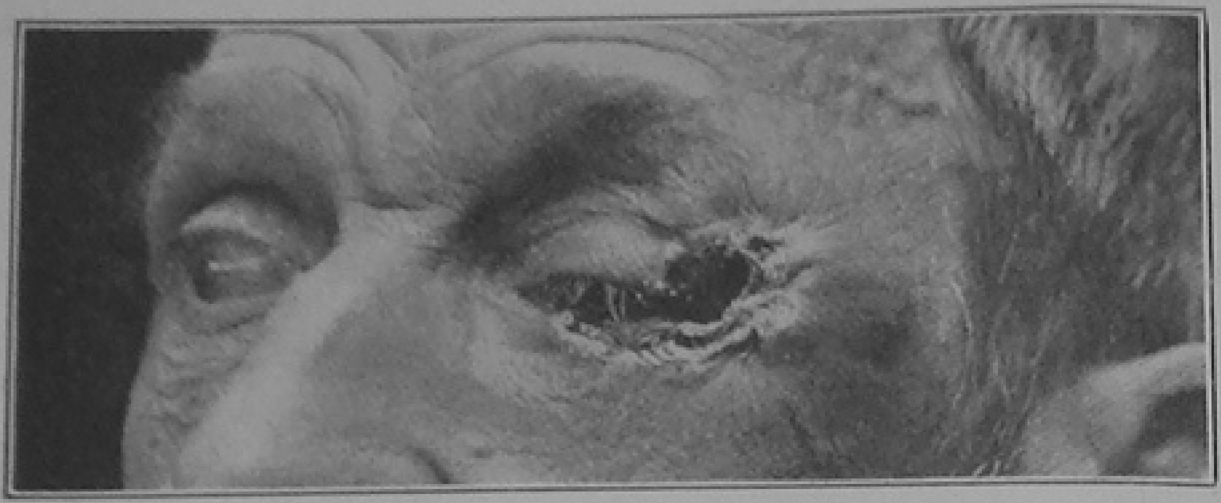

FIG. 1, CASE 1.

May 2: Complete relief from pain for twelve hours.

May 7: Scab from central and hardest portion of tumor fell off.

May 26: Now no pain at all. Hair of beard where exposed to *x*-ray has fallen out.

June 13: Cancer entirely disappeared—no symptoms and no indications of disease can be discovered.

Duration of treatments about seven weeks and about twenty-one treatments.

It should be stated in connection with this case that Dr. Am Ende during the *x*-ray treatment maintained for his patient a dosage of thyroid extract manufactured especially by himself, in order to be sure of its quality, and full weight in securing the excellent result should be given to the medicinal remedy. Up to the time of treatment by the *x*-ray, however, the thyroid by itself had produced no effect, although its use had been for a long time continued.

CASE V.—October 6, 1902. Mrs. G., aged thirty-seven years. Epithelioma of lower eyelid. (See Figs. 5 and 6.)

Twelve years ago injured the lower eyelid; four years ago the injured spot began to itch and a scab appeared, forming altogether a small ulcer with an indurated base and elevated and rounded margins. The tumor has been cut out once, once scraped out and various ointments and nitrate of silver have been used, but it refuses to heal and is now enlarging.

Patient reports that specimens examined by Dr. I. Danforth of Chicago and by Dr. Ard of Plainfield, N. J., have been pronounced to be epithelioma.

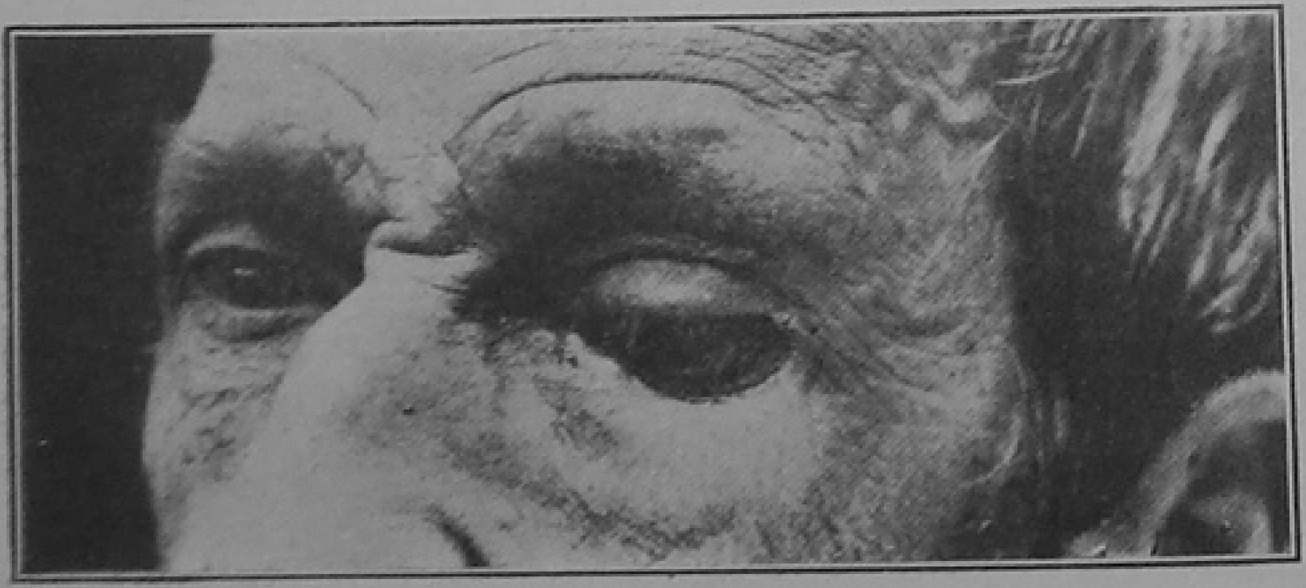

FIG. 2. CASE 1.

December 27: In about eighty days, or with about thirty-three treatments, the ulcer appears to be cured. (See cut.) Incidental to the disappearance of the ulcer is the appearance of a notch in the lower lid showing where previous operations had taken place. The new growth had previously filled up this notch.

In this case I frequently employed adrenalin

s, and it is quite possible, by securing an artificial pallor, to increase the effect of the treatment. I pursue the same plan frequently with other cases.

The patient now went to Europe with the understanding that she report progress on her return this spring.

Bearing in mind the case reported by Dr. Wilbur B. Marple of this city, of favorable effects due to adrenalin alone in such a case, I had thought of advising her to use this remedy while abroad, but a week's preliminary trial satisfied me that the secondary reaction more than counteracted any advantage gained from the primary pallor. I therefore am satisfied to use adrenalin merely as a mechanical producer of pallor preliminary to *x*-ray treatment and not for an otherwise curative purpose.

CASE VI.—April 4, 1902. H. W., aged forty-four years. Epithelioma of face, on cheek below the eye. First noticed a small red speck like a "broken vein" about fifteen years ago. About five years ago this spot became sore and increased in size and began to form scabs which from time to time fell off. The ulcer now measured about one inch in diameter, while the disease also extends beneath the adjacent apparently sound skin. Patient has tried caustics and various measures of treatment with no avail and is much discouraged.

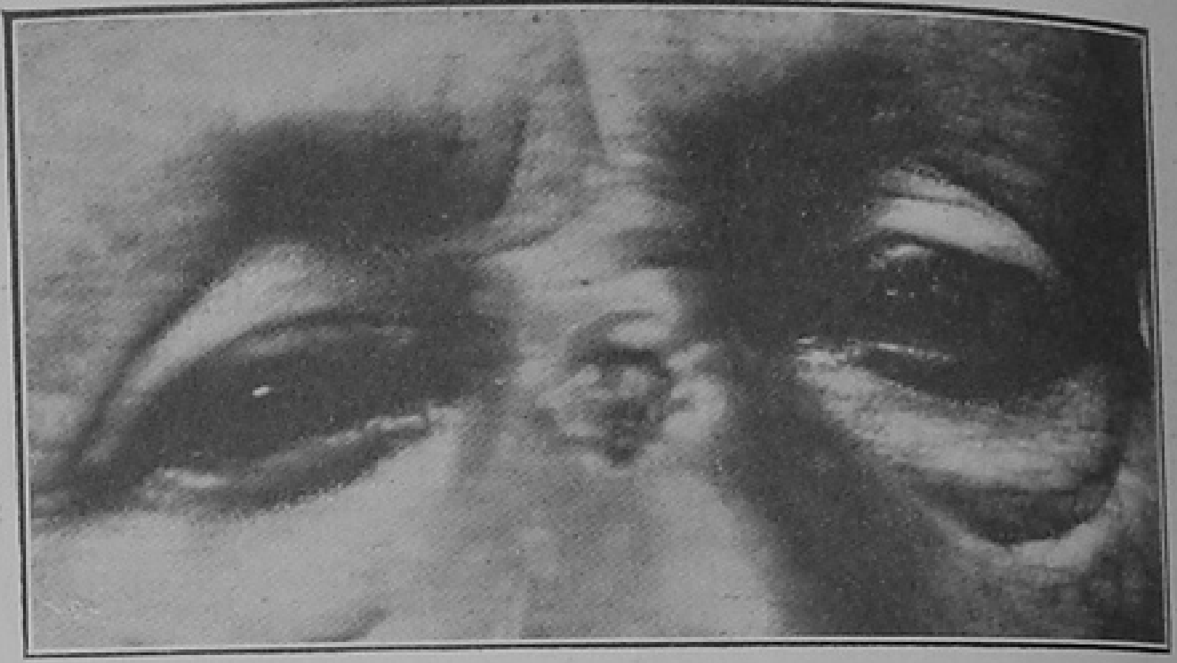

FIG 3, CASE 3.

Treatment: *X*-ray with shield.

May 23: Ulcer began to heal at once but slowly. Measurement to-day, one-half by one-half inch in diameter.

June 24: A very thin, delicate, new skin entirely covers the ulcer. This skin looks as if it might break down at any moment and causes doubt as to the results for a while yet. Referred to Dr. L. Duncan Bulkley, who writes, "There seems to be no doubt about there having been an epithelioma, but now there are almost no elements for a diagnosis. The *x*-rays have certainly done excellent work."

The case had been really cured in seven weeks with twenty-one treatments. In July, however, a very small persistent hard spot, perhaps double the size of a pin head, caused him anxiety and I gave a number more of treatments and the patient returned to Canada.

On October 17 he writes that the cure seems to be permanent, and this is corroborated on February 1, 1903.

Dermatitis was freqeuntly established. The healing is not like cicatricial tissue, but is true skin, which is indistinguishable from the adjoining skin.

CASE VII.—Miss S., epithelioma of the face, has been quite fully reported in the issue of this journal of March 8, 1902, as Case VII. It is presented here, together with an illustration, Fig. 8, as an offset to any too favorable impression created by anything in this paper in regard to cancer of the face. The patient made, as reported, steady progress for a few months; the edges inverted, the indurations softened, the ulcer steadily decreased in size and a peninsula of healthy skin projected some distance toward the center of the ulcer. Then there steadily and slowly developed an extensive spread of the disease which no effort on my part with the *x*-ray or the violet ray could stem, and I was obliged to admit defeat. I saw but one hope remaining for her, and sent her, also with the advice and consent of Dr. Clement Cleveland, who had originally sent her to me, to Dr. A. R. Robinson, for an attempt to curtail and cure the ravaging ulcer by means of caustics. I understand that the unfortunate patient is now making favorable progress under the caustic treatment. I have no explanation to offer of this failure, except that others like myself have found this type of deep-seated epitheliomata with everted edges and "pearly nests" to be difficult if not impossible to cure with the *x*-ray. In all fairness it may be stated that doubts of the disease being an epithelioma were expressed by good authorities, but Dr. Robinson, on the other hand, whose opinion carries great weight, believes it to be unmistakably a true epithelioma.

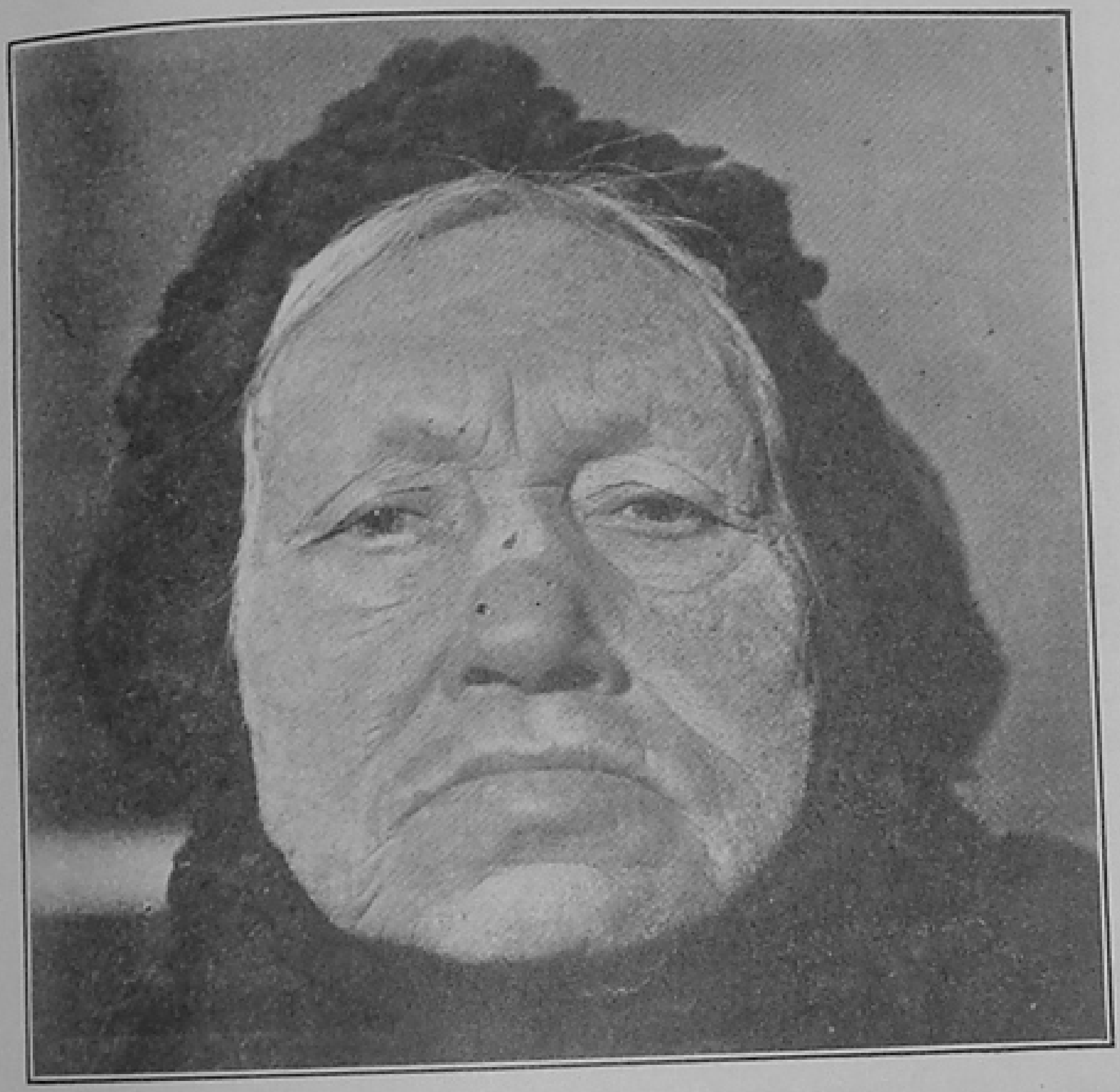

Fig. 4, Case 3.

Case VIII.—Carbuncle. April 13, 1902. The patient was brought to me by Dr. J. M. Liebermann, who has kindly furnished me with the data relating to the onset and final outcome of the case.

Thomas P. D., lawyer by profession, forty-four years of age, appearance of good health. Had a carbuncle a year ago. Had to stay in bed for two weeks in succession, suffering intense pain awaiting the softening of the tissues; duration of attack altogether between six and eight weeks. Two ugly scars now on the back of the neck attest the severity of the case. The patient was first seen by Dr. Liebermann on the 11th day of April; he had been suffering intense pain then for three of four days, with high temperature; a new and large carbuncle had developed on the back of the neck. The pain extended down the neck to the left scapula and induration extended to the occipital protuberance as well as downward over a large area.

Application of *x*-rays, a "high tube," powerful *x*-ray, six inches distance, hole generously large cut in a sheet of lead for a shield, duration eight minutes.

Within two minutes the immediate carbuncle area turned violent red, then purplish red and dusky in hue; this hue was maintained to the end of the treatment of eight minutes, when, upon examination by palpation, it was found that what had a few minutes before been a hard, stony tumor had now broken down into a softened mass three-quarters of an inch in diameter, leaving still, however, a crater-like ring of moderate induration round it; the *x*-ray had self-evidently forced a resolution in this brief space of time. At the same time the patient was completely relieved of pain and could with the greatest freedom turn his head from side to side. This in marked contrast to the fixedness of the pose of his head when beginning treatment.

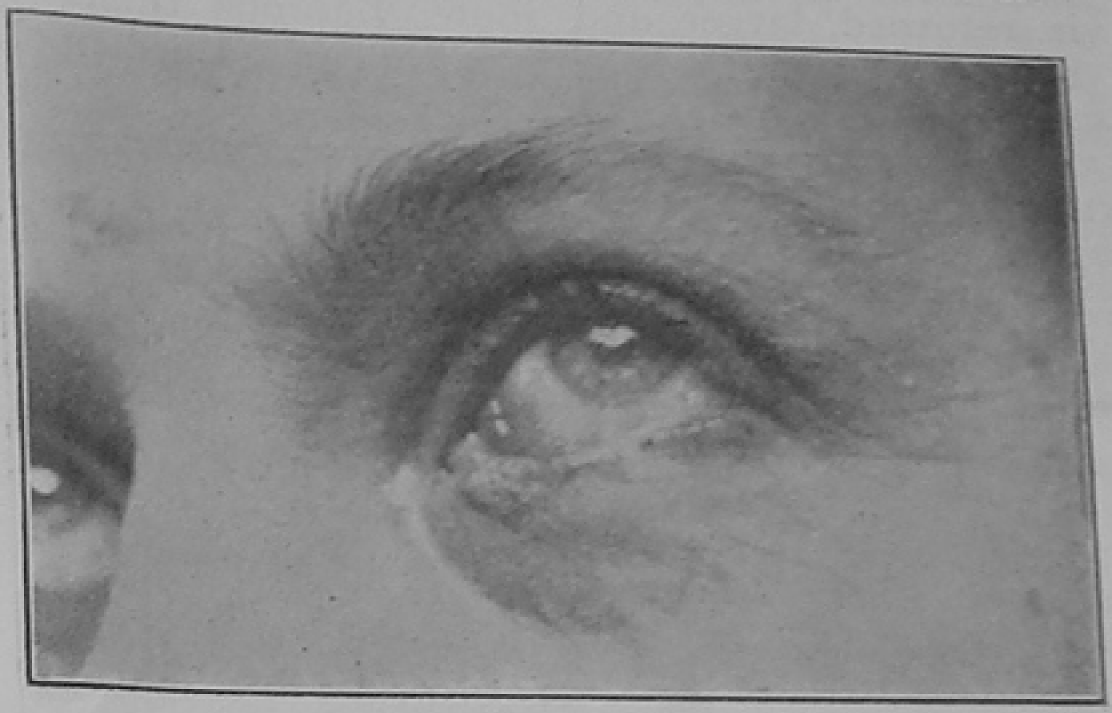

Fig. 5. Case 5.

Second treatment, April 14, with precisely the above effects over a wider area.

Third treatment, April 16. This treatment was really unnecessary, for the carbuncle was evidently so "ripe" that a slight touch of a knife to the very thin layer of skin over it would have permitted of an escape of its contents.

On the night of April 16 the carbuncle burst spontaneously, and on the next day in cleansing the wound no pus, except a mass of cheesy matter, was removed, and by slightly pressing on the border of the wound, the root of the carbuncle was removed in the shape of tenacious tape-like matter of two and one-half inches in length and about one-eighth inch in width.

Neither during the closing of the wound, nor at any time during the attendance, was pain experienced by the patient.

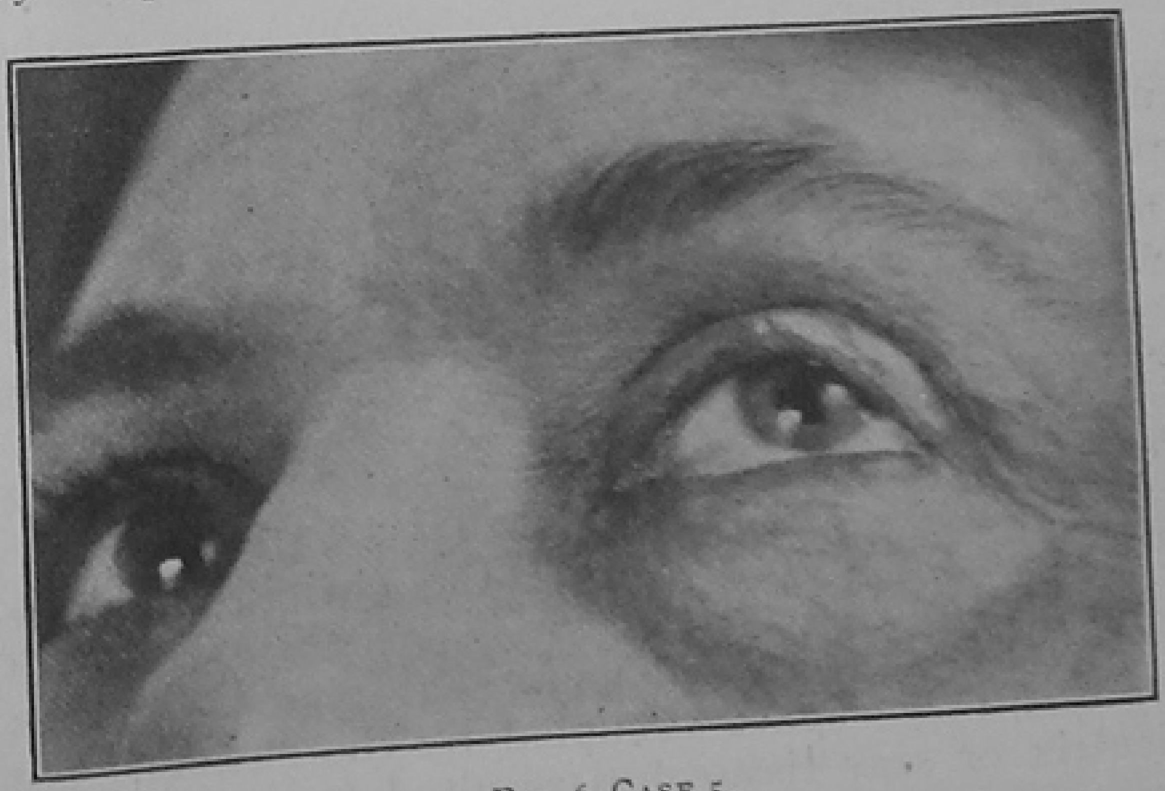

Fig. 6, Case 5.

Full recovery of the wound occurred on April 22, when the patient was discharged, making altogether eleven days for treatment of this most ugly carbuncle.

Patient during all the time was able to attend to his usual occupation in court and in office without inconvenience.

Case IX.—Cheloid. March 7, 1902. Patient, a young lady, Miss E., aged twenty-one years, referred to me by Dr. Robert T. Morris, had ununsightly cheloid on the neck. On a trip up the Nile she had contracted variola; three pustules had formed and in one of these the cheloid grew. Dr. Morris removed the cheloid by the knife, but it promptly returned; he removed it again, and again it returned, larger and more vigorous than ever before. Under these circumstances a third operation was deemed inadvisable. It now measured two inches in length by three-quarters of an inch in breadth and one-third of an inch in height. It was bright red, of cartilaginous consistency and permeated by a rich and fine network of capillaries.

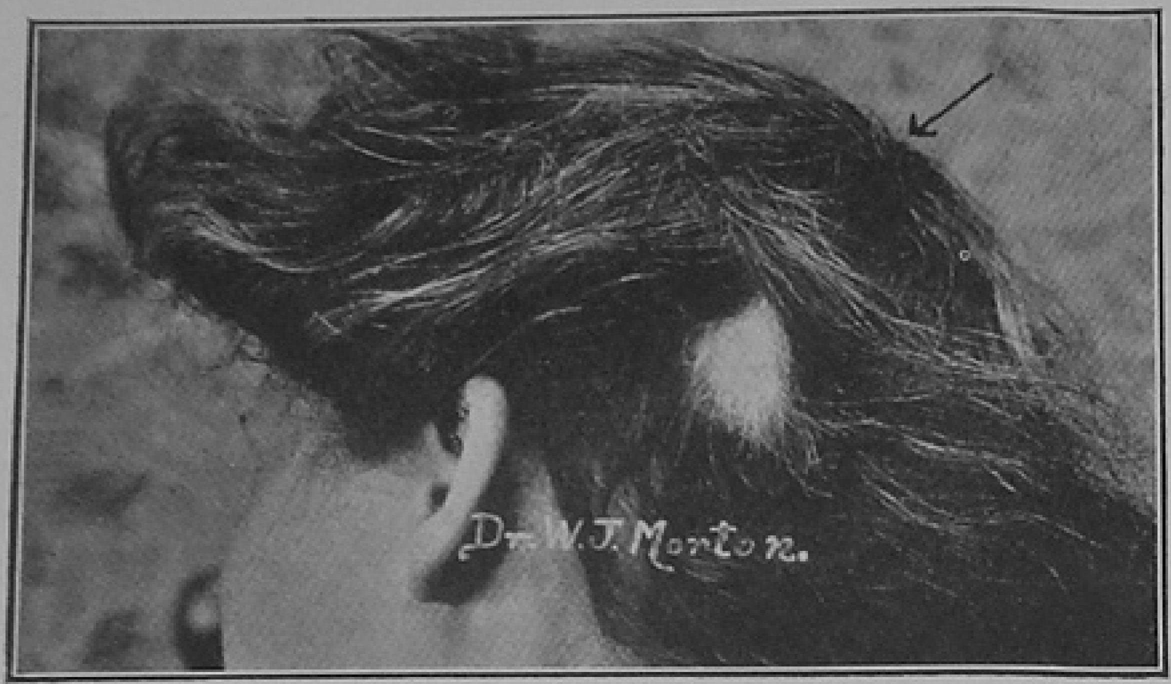

Fig. 7.—Alopecia Areata.

Treatment: *X*-ray, high tube, powerful *x*-ray, nine inches distance, shield, three times weekly. The shield left exposed an area of sound skin one-one-quarter of an inch around the growth, in order to be sure of including the entire edge of tumor within the influence of the radiation.

At the third treatment the tumor looked and felt "flabby" and was soft. Soon extensive dermatitis was established on the ring of exposed sound skin, but in the cheloid tissue itself the dermatitis was much more severe and the mass discharged serum and pus.

By May 22 (twenty-seven treatments) the inflammation seemed to be too great safely to proceed further and treatments were suspended.

June 7: Patient returns. Cheloid has greatly reduced. It measures about one inch by one-quarter of an inch, is flattened to the level of the sound skin, and offers little sensation of thickness to the touch. Patient now left the city for the summer under promise to report in the fall.

October 20: A small ridge of cheloid tissue remains at one end of the original tumor, but otherwise the cheloid has entirely disappeared.

To this spot three treatments were given, making a total of thirty treatments.

November 11: Nothing whatever now remains of the cheloid. The skin is soft and smooth.

Across the former site of the cheloid runs the thin linear cicatrix of the last operation. On either side of it a still somewhat pigmented area represents the space occupied by the cheloid. No cicatrix or scar tissue has resulted from the *x*-ray treatment.

Practically the actual time occupied in treatment was from March 7 to May 22.

Case X.—Cheloid. October 1, 1902. Mr. McF., cheloid on neck. Began about four years ago at the site of a linear scar on the neck. It now measures three inches in length by one-half an inch wide and is elevated quite one-half an inch. Ingrowing hairs of the beard within the mass cause him much annoyance.

Treatment: *X*-ray.

November 11: Cheloid growth highly inflamed and appears like a raw sore exuding serum and pus. It is flattening out and diminishing in size rapidly.

December 16: Still an open granulating surface. The amount of serous and purulent discharge is great. To palpation no cheloid thickening can be felt except a small spot at one end, apparently not so fully exposed to the *x*-ray as the rest of the tumor.

January 27: Open sore entirely healed over. Site of tumor flat and on level with sound skin. As the cheloid tissue finally retreated the patient removed from time to time three hairs about one and one-half inches in length which had been left freely exposed. The original linear cicatrix not before discernible has also come plainly to view, and, as in the prevous case here reported, on either side of it remains a pigmented area of sound and normal skin. And, as in that case, so in this, the result has not been the formation of a cicatrix but simply a retreat of a diseased condition leaving behind it a normal skin. Cheloid completely cured.

Case XI.—Acne, April 3, 1902: Miss E. B., aged twenty-one years. Acne of face, chest, and shoulders. Disease began at the age of thirteen, first as red spots upon the nose, and has since spread over the entire face and on to the neck, chest, and shoulders.

The patient experiences what she terms "bites." There is first a stinging sensation, then a small white patch, which quickly swells to a reddish or purplish lump, at the top of which a small drop of serum appears. The lump subsides in about an hour. The face is scarred and "lumpy," thick with comedones and of a dull, dusky-red. dirty color, constituting a muddy and raw complexion very disagreeable to look at. The nose is thickened and, of coarse, contour from the disease.

Dr. G. H. Fox kindly confirmed the diagnosis.

Treatment: *X*-ray to face, suspending a lead disc three-quarters of an inch in diameter by adhesive plaster before each eyeball to defend the retina. Also shield for hair of head.

May 1: A continued dermatitis of a bright red has now been maintained for two weeks. There is a remarkable cleaning up of the acne, and the face complexion is becoming decidedly fine and velvety.

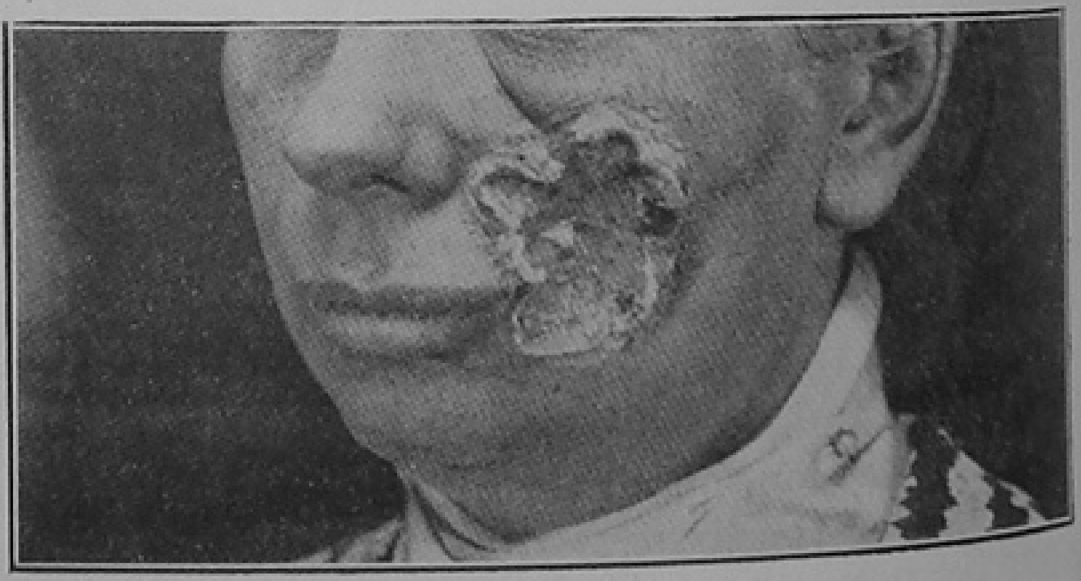

Fig. 8.—Epithelioma of face not cured by *x*-ray.

June 3: Now and then a "bite" coming to a pustule. Skin of face, even to that of the ears, cleared up. The, nose, which used to feel "thick and podgy," has resumed its normal shape.

At the same time the patient's general health has much improved. Her headaches have disappeared, also a general feeling of sleepiness. A distressed feeling of the stomach with frequent nausea and retching has ceased, and she can eat any sort of food without subsequent discomfort.

June 7: Some hair falling out at top of forehead.

Face shows severe *x*-ray burn and is scaly, dry, and purple red.

June 21: Last treatment on June 11. Came for treatment June 14, but the face was too purple, red, and swollen to risk another application. Applied "cold cream." Face intensely red, but in three days the swelling subsided. During this week serum has flowed freely from the surface of the skin of the face and from the swollen lips. The skin burned and itched until the watery flow was established, then it felt comfortable. The eyebrows have fallen out and the lower lashes; the upper lashes still hold on fairly. The skin of the face has entirely peeled off, and a new skin is appearing clean and delicate and pure as that of a healthy baby. The nose likewise is fine in contour and entirely clear of disease and has a delicate new skin.

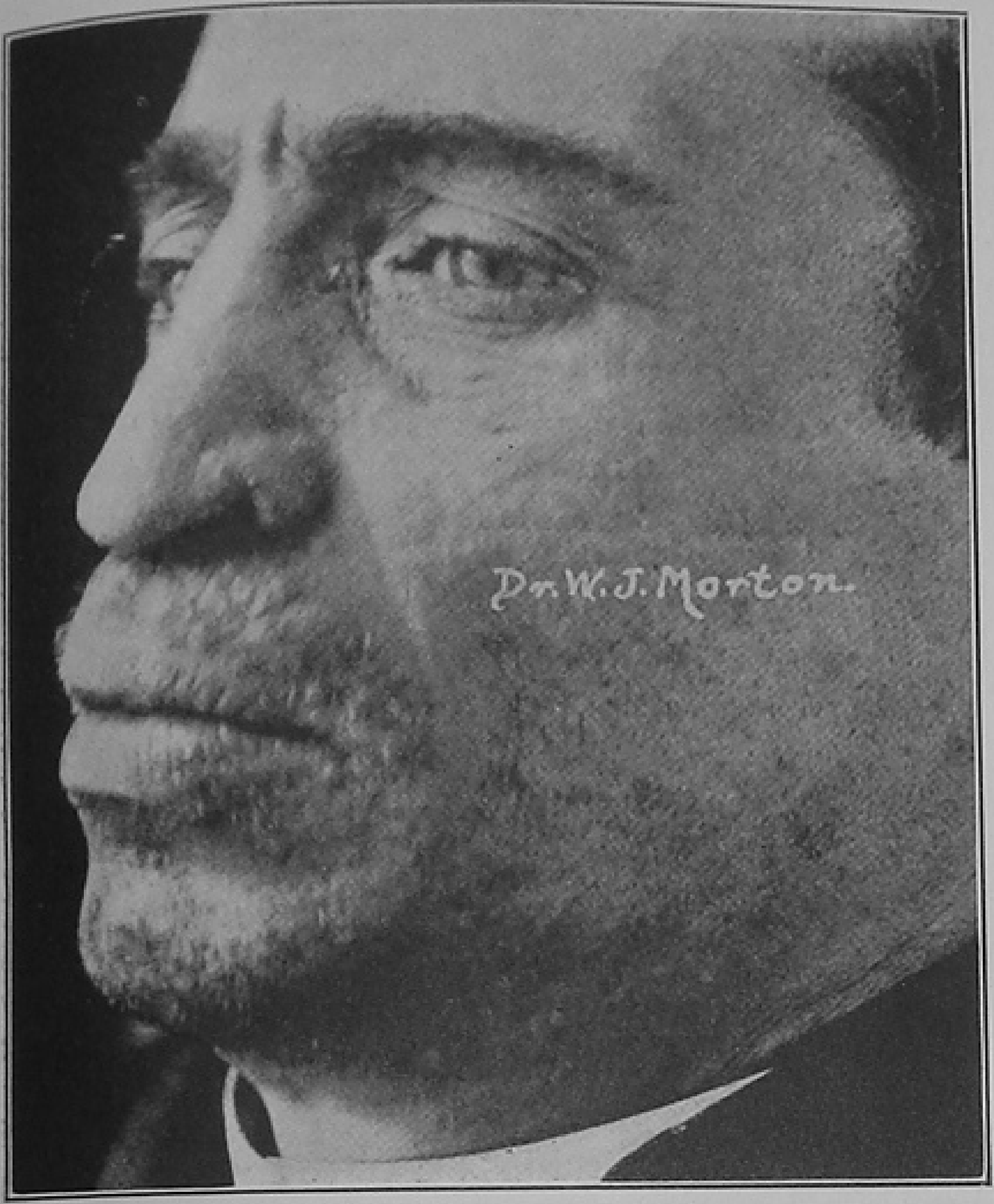

Fig. 9.—Sychosis.

June 25: Remains of dermatitis are now simply a rosy color and the skin is of a fine healthy and beautiful texture, with, of course, no sign of the former acne. The neck and shoulders shared in the transformation.

Patient cured.

Duration of treatment about two months; total number of treatments 26.

Subsequent Note.—October 8: Patient called to report results. The face presents an absolutely perfect and fair complexion and without any sign whatever of disease. The eyelashes of both the upper and lower lids fell out completely just after the patient's last visit of June 21. Also at about the same time the eyebrows peeled off completely with the skin. In three or four weeks the eyelashes began to reappear, at first quite fine and light, but as they grew longer they grew blacker and stronger and are now fully restored. In about seven weeks the hair of the eyebrows returned. The hair for one inch back of the top of the forehead extending from ear to ear fell out, but is now growing luxuriantly and has attained at the present moment one inch in length.

Case XII.—Alopecia areata, Fig. 7, April 11, 1902. Began seven years ago with a spot the size of a five-cent piece on the back of the head. The hair fell out, and from that time on to the present new and large patches have continuously appeared. The new hair would grow in snowy white and the coloring matter only appear after a growth of about one inch in length had been attained. Perhaps in six months the hair would again fall out in patches. It is not my purpose to report this case in full, but merely to point to Figure 7 and to a large patch of dark luxuriant hair of an area about as large as the palm of one's hand, indicated by the arrow. When perfectly bald, *x*-ray treatment of this spot was begun, with the usual technique referred to in this paper. The hair at first continued to fall out. On May 2 it ceased to fall. On May 5 signs of growth of the hair in the denuded area began to appear. Treatment continued until July 1.

September 8: Patient returns after an absence of two months to report that the hair had grown luxuriantly in the formerly denuded part, and that for the first time in her experience it had grown in black from the start.

At last reports, now about four months ago, the new hair remained. In the cut, Fig. 7, below the spot treated, is shown an untreated spot.

The favorable effect of the *x*-ray, is clearly demonstrated by the result in the large area alone treated by it.

Case XIII.—Sychosis of the upper lip and chin. S. S., aged forty-two years. Has had sychosis on the chin for five years and upon the upper lip for two years. Patient has tried faithfully innumerable treatments with no avail and states that nothing ever acted upon his disease so quickly or so thoroughly as the *x*-ray. The skin presents the usual nodules, papules and pustules and is deeply infiltrated. Fig. 9 illustrates the case better than would further description. Fig. 10 represents the case after six treatments, three times weekly. There is now no infiltration and no sign of the disease. The hair of the upper lip fell out at the end of two weeks. With the danger of relapse characteristic of this disease in mind, treatment will be prolonged for some time yet. Of my other cases this disease have shown identical results under *x*-ray treatment.

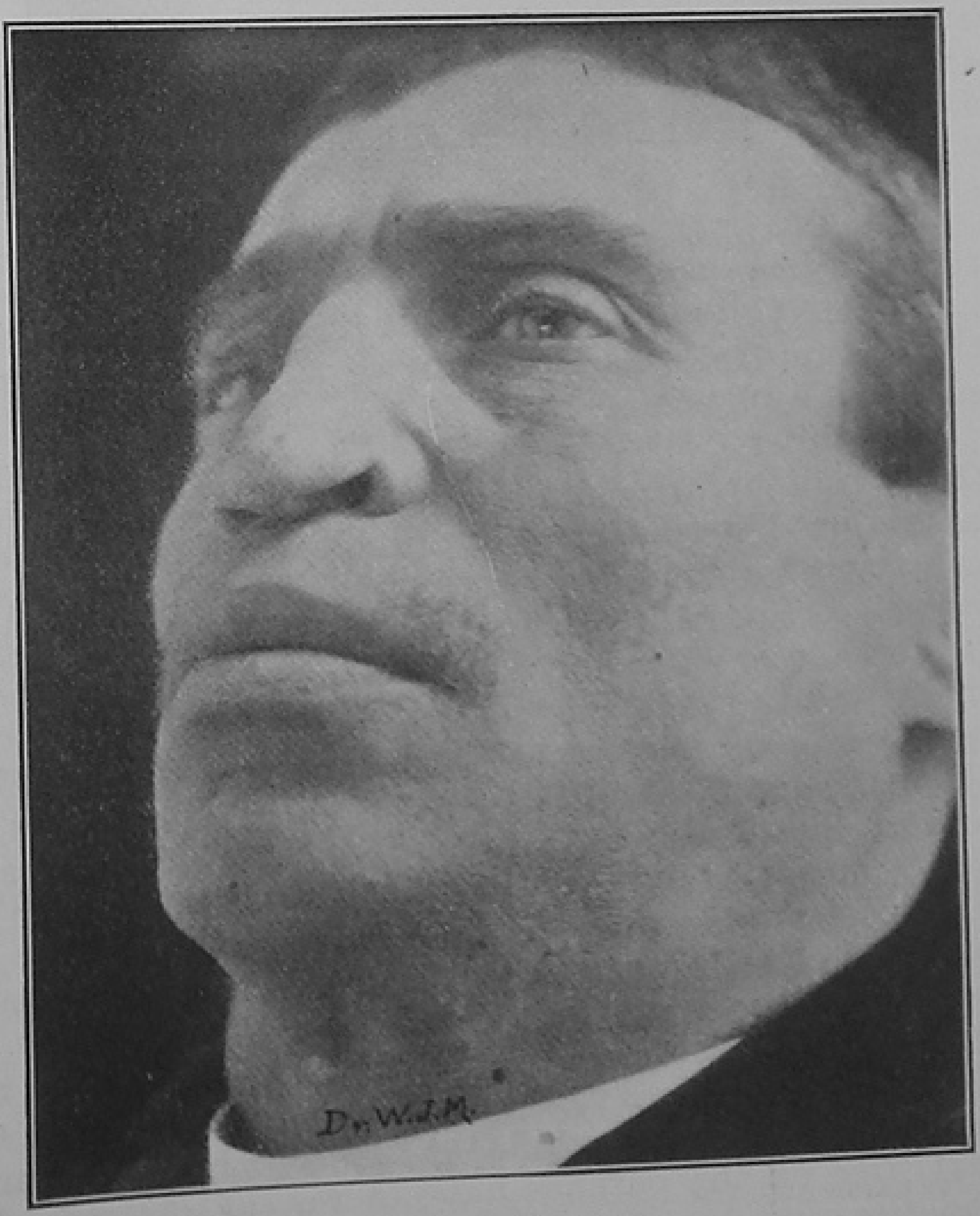

Fig. 10.—Sychosis.

CASE XIV.—Mrs. J. B., aged forty years. Fibroid tumor of the uterus.

August 4, 1902: Tumor began about five years ago as a swelling, noticeable in the iliac region. Present examination reveals the tumor to be a large, hard, rounded mass, filling the abdomen quite to the epigastrium, and resembling in contour an advanced pregnancy. Patient is "nervous," suffers from pressure symptoms and is continually subject to severe and dangerous hemorrhages. Frequently from month to month the flow of blood would not cease, and she often almost lost consciousness. The physicians summoned had endeavored in vain to arrest the hemorrhages by ergot and other measures. At times the pain attending the hemorrhages was excessively severe. She has been confined to her house now for nearly four years. I advised an operation for the removal of the tumor, but this the patient would not listen to, but begged that the *x*-ray might be tried in her case as an experiment. To this I consented.

Treatment: *X*-ray three times weekly, externally 20 to 30 minutes, very high tube whose radiation was conclusively shown by the fluroscope to have passed through the tumor. Relation of tube to the patient externally was frequently changed.

August 25: Patient *x*-rayed nine times and reports that her menstruation had occurred with almost no pain, with almost scanty flow, and that this had been the first time for years when she had not been obliged to take to her bed and remain there, and take large doses of ergot and often summon a physician.

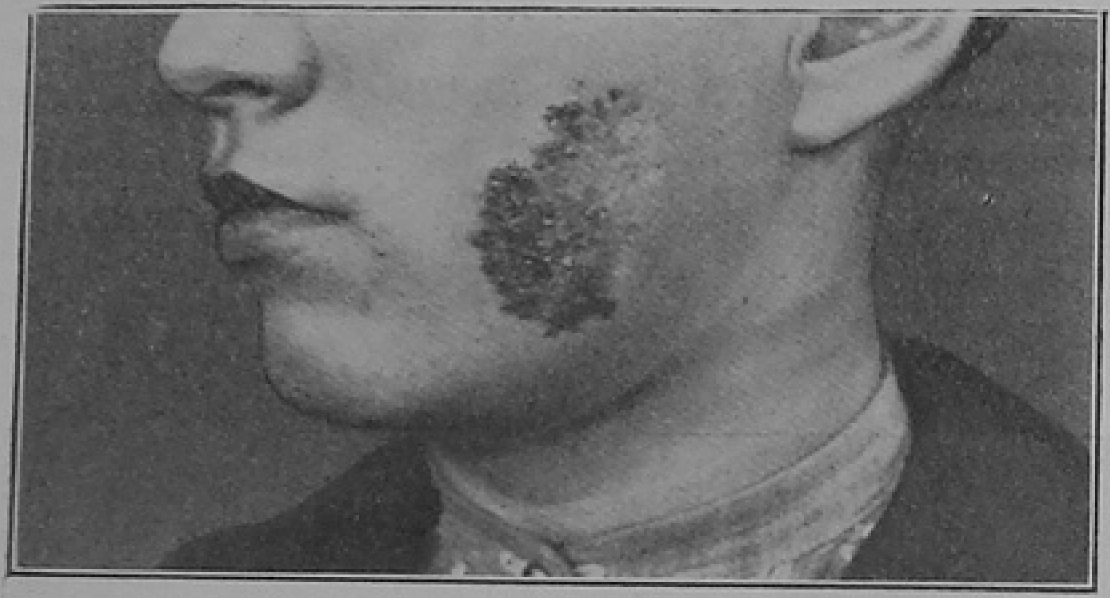

FIG. 11. CASE 16.—Lupus vulgaris.

November 30: About three months' time and thirty-nine treatments to date. The tumor itself has reduced at least one-third in size and a complete symptomatic cure is obtained. The menstrual periods are regular, natural, and painless, and no hemorrhages whatever have occurred since treatment was begun. The *x*-ray therefore in this case has restored menstruation to normal, arrested the condition of severe and dangerous hemorrhages, and produced a symptomatic cure, together with a very considerable reduction in size of the growth. The patient can now get along very comfortably, but wishes soon again to resume treatment to see how much more can be attained.

CASE IV.—Psoriasis. Mrs. H. C. J., aged thirty-three years. Disease began when she was ten years of age, with a small patch beneath the eye. From that time on the patches have increased in number and size and have extended in large areas almost over the entire body, mainly on the back and toward the hips, the neck and chest, knees and elbows, and general extensor surface of the limbs, and has also invaded the scalp. There are many individual patches on the body larger than the combined area of two hands. A detailed description of the disease is not essential, since its characteristics are entirely classical and typical and a picture of similar cases may be seen in any classical atlas of skin diseases. The patient had taken many kinds of treatment during all these years and without success. I had tried the brush discharge and statical electricity also, unsuccessfully. The patient was then put upon *x*-ray treatment. A large and powerful tube was provided, of high vacuum, and the patient, thinly clad, stood before the tube, taking the *x*-ray over the entire body for about half an hour or more, three times weekly. The patches of psoriasis began to thin and ceased scaling, and reduced in activity immediately after the first week's treatment. By the end of the second week at least thirteen large patches had entirely disappeared and the skin where these had formerly existed was perfectly normal, and by the end of the third week it was impossible to find the previous locality of many patches. By the end of the fourth week the arms and neck and back were perfectly clear of disease and the legs presented but faint blushes showing the locality of the disease. At the end of six weeks the patient is entirely cured, and, curious to relate, the patches on the scalp ceased at the same time, although no treatment had been applied to them specifically on account of a fear of affecting the hair unfavorably. Indeed, the patient wore a lead mask to protect the hair of the head. The fact that the scalp patches have been cured would seem to indicate that the effect upon this disease has been constitutional, as well as local, and taking into consideration that the *x*-ray thus generally administered acts as one of the best nutritional tonics to the general health, it is not strange that this should occur. Of course, in this case the usual possibility of a recurrence must be taken into account, but the rapid disappearance of extensive psoriasis in this short space of time establishes beyond question that the *x*-ray is a most potent form of treatment for this hitherto intractable disease.

CASE XVI.—Lupus Vulgaris. Miss H. M. T., aged fifteen years, Halifax, N. S. At eight months of age mother noticed a small lump, size of a pea, on the left cheek. In three weeks this formed an abscess which was lanced and it appeared to be well. Soon after this noticed that the spot was becoming red, and the redness spread slowly but surely, until at two years of age it was the size of a silver dollar. The physician applied caustic and other agencies freely and frequently, but to no avail. Later on, the lupus, now larger than a silver dollar, was curetted several times, but still increased in size and activity.

Examination, 1902. On the patient's left cheek is a dull red patch measuring one and three-quarters by two and one-quarter inches and spreading aggressively on its anterior and lower borders, while posteriorly the color is paler (Fig. 11.) This patch is elevated above the surface of the cheek, firmer at its edges than in the center, and throws off fine scales. The infiltration extends deeply into the tissue of the cheek.

Microscopical examination by Dr. H. T. Brooks of the Post-Graduate Hospital Laboratory establishes the diagnosis.

I first tried in the treatment of this lupus, during a period of about two months, a fairly mild *x*-ray, producing simply a mild dermatitis of the adjacent sound skin. The lupus at first became swollen, and puffed up and looked angry, then gradually showed a shrinkage in its area and gave off large, flat scales. It presented a concavity instead of a convexity, and became saucer-shaped, but did not entirely subside, although showing a profound reaction and a great disposition to repair.

Becoming weary of mild treatment, I substituted more powerful treatment. An aperture in a lead shield was cut, so that one-half an inch of normal skin around the edges of the lupus was fully exposed, and the *x*-ray treatment was then carried on three times a week until the sound skin presented an angry purplish red *x*-ray dermatitis, while at the same time the lupus itself began to appear swollen, angry looking, very red, exuding serum, and elevated. The normal skin was thus left exposed for a control and guide as to the extent to which the *x*-ray could be safely pushed, the presumption being that the lupus area would receive a due and proper amount of treatment within the limits of severe dermatitis upon the normal skin. This management of the case was eminently successful, for upon ceasing treatment at a time when the severe limit of dermatitis of the skin had been established and the lupus itself had been excited to an angry condition, the *x*-ray was stopped, and the lupus over a period of two or three weeks went on by itself without further treatment to a complete cure. The lupus area healed without the production of scar tissue, and the skin previously occupied by the disease is now as sound and natural as any skin of the face.

I am now treating all cases of lupus by using the sound skin as a control of the treatment, as above described, and find this method more successful than either milder or more excessive treatments.

10 East Twenty-eighth Street.

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**The Limits of Variation in the Depth of the Mastoid Antrum.**—From a series of measurements, P. D. Kerrison concludes: (1) That in operations upon the mastoid process the antrum should always be approached from the nearest point upon the mastoid cortex, which, in the great majority of bones, is the small triangular space behind the spine of Henle. (2) That this point of attack not only furnishes a guide to the site of the antrum, but also gives fairly accurate data as to the depth beyond which it is not safe to proceed. (3) That the depth of the antrum is always less than the length of the postero-superior wall of the meatus; that in the great majority of bones it is not over 12 mm., is often very much less, and is never greater than 15 mm., or ⅝ inch; and therefore (4) That in a surgical attempt to expose the antrum a depth of ⅝-inch should be regarded as the extreme limit of safety.—*Archives of Otology.*

**Sulphocarbolate Treatment of Cholera Infantum.**—William F. Waugh says that every case of summer complaint, enterocolitis, and cholera infantum that he has attended in the past twenty-five years has recovered under the use of the sulphocarbolate of zinc. His method is the following: Clear the bowels with castor oil, calomel, mercury and chalk, aromatic rhubarb, lavage or colonic flushing as seems best in each case. For lavage he prefers a solution of zinc sulphocarbolate, a grain to the ounce; for colonic flushing the same, for rectal flushing or when the type is dysenteric, silver nitrate, two grains to the pint. The solution should be as hot as bearable. Then follow with zinc salt, from one-sixth grain to two grains every hour. He has given the latter dose hundreds of times to children in their second summer, without irritation. Some take the medicine in solution, others in granule or tablet form, but if there is a decided irritability of the stomach, it is best in powder with bismuth and pepsin. When there is extreme acidity, marked by excoriation of the rectal mucosa, etc., sodium sulphocarbolate is preferable, or the triple salts, zinc, sodium, and lime, may be used with advantage.—*Alkaloidal Clinic.*

# CONGENITAL LARYNGEAL STRIDOR.*

By JAMES E. NEWCOMB, M.D.,
NEW YORK.

During the last few years the writer has seen three cases diagnosticated as the so-called congenital laryngeal stridor, and though the circumstances in each case have been such that it could not be followed, and its later history obtained, he has been deeply interested in the study of the subject, and has deemed it one not unworthy of the attention of this association. The literature is not voluminous, and pretty much all that has been written has come under examination.

By the clinical term describing the condition is meant a stridor coming on within a few days of birth, continuing for a certain period, measured usually in months, but possibly in years, apparently not doing the child much if any injury, and finally subsiding of its own accord without sequelæ. It seems to have been first described by Rilliet and Barthez in 1853. It has been variously termed "Inspiratory Stridor of Nurslings" (Avellis), "Stridulous Respiration of the Newly-born" (Comby), "Clonic Glottis Spasm of Nurslings" (Löri), "Respiratory Croaking of Babies" (Gee), "Posticus Paralysis of Infants" (Robertson), and "Congenital Laryngeal Stridor" (Rocaz, Suckling, Stamm). No therapeutic measures have seemed to shorten or essentially modify its course. Consequently the literature has mainly concerned itself with theories of etiology and criteria of differential diagnosis.

As frequently happens in the case of rare diseases, some of the writers have endeavored to establish, from a very limited experience, a too rigid symptomatology, and in the light of our present knowledge have too sharply drawn the lines of their clinical picture. This fact is illustrated in the statements collated on the topic in the recent book of P. Watson Williams. Thus he remarks that "the usual physical signs of obstruction are presented during the exacerbations, such as cyanosis, retraction of the epigastrium and lower ribs, and depression of the supraclavicular fossa and episternal notch." On the other hand, the majority of those who have described the condition deny the presence of these clinical features. No such evidence was presented in the cases seen by the writer.

The malady seems to predominate in male babies, though no reason is assigned therefor. In so far as laryngeal examination has been applicable, it has revealed a malformation of the laryngeal vestibule, epiglottis, and aryepiglottic folds. The epiglottis has lacked its normal curvature, being folded on itself, so that its shape has been that of an arched or curved roof; or, the aryepiglottic folds have been devoid of their usual firmness, and their free ends, being thin and flabby, have nearly touched. In some instances the upper part of the larynx has seemed contracted by protuberances capable of vibrating and of playing the rôle of supplementary cords. In a second and less marked variety, the changes have been rigidly confined to the epiglottis and aryepiglottic folds, the former being rolled on itself like the end of a flute, the folds themselves approximating only anteriorly, and the *ensemble* vibrating under the effect of the air.

The causes of this condition are not always easy to find. In view of its suggestion of the familiar laryngismus stridulus, and the fact that many cases of the latter occur in rachitic subjects, some have supposed that rachitis is at the bottom also of congenital stridor. In a general way the most common are at least three mitigators: (1) sodium chloride; (2) the body's heat-regulating apparatus, and (3) the transient duration of the temperature (120°).

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*Paper presented at the twenty-fifth annual meeting of the American Laryngological Association, held at Washington, D. C., May 12–14, 1903.

Sodium chloride raises the coagulating point of albumin solutions, *e. g.* serum albumin in pure solution may be coagulated at 50° (122 F.), but the addition of NaCl. raises the temperature required for coagulation to 75°, or even to 80° (167° and 176° F.).

When a hot injection is made into a vein of the forearm, there is a constant unchecked radiation from the apparatus employed, and furthermore the patient's heat-regulating mechanism has some opportunity to modify the warmth before the blood is sent through the internal carotids and vertebrals. If, however, the temperature of the internal carotids is raised and maintained by contact heat, these vessels having no branches in the neck, the heat is conveyed into the cranium, through the circle of Willis, and simultaneous elevation in the vertebrals should render the effect, on the medulla and respiratory center, direct and marked.

The following from "Foster's Physiology" may prove interesting (I change some sentences for brevity's sake): "If the blood in the carotid be warmed above normal, dyspnœa is produced. It is not identical with that caused by imperfect arterialization of the blood, but it shows that the too high temperature of the blood directly affects the activity of the respiratory center." And again, "the regulative heat mechanism is unable to withstand the strain of too great an external heat or too prolonged an exposure to a less degree." Too warm blood exhausts the metabolic capital of the respiratory center, and it hurries on the beats of the heart, each stroke becomes more and more feeble as the rate is quickened, the beats become irregular, and finally cease. "Either of these two events alone, and certainly both together, are enough to bring mechanism to an end."

Ralliere demonstrated (dogs) that the blood temperature may be increased to 107° F., or (temporarily) even to 109.2° F. if immediate cooling is allowed. He states very plainly "The danger of hyperthermy lies in the duration." Now we can raise the temperature of the contents of the internal carotids above these figures by direct heat which may be maintained more or less indefinitely. But to return to our Medical Physics and ignoring all the nervous mechanisms of the body. Given a person weighing 143 pounds, whose blood weighs 13 pounds, and has a temperature of 100°, what will be its temperature if 6 pounds of salt water at 120° be mixed with the blood? The mixing to be instantaneous.

6 pounds @ 120° = 720 heat units.
13 pounds @ 100° = 1,300 heat units.

19 pounds @ × = 2,020 heat units.
2,020 ÷ 19 = $106\frac{6}{19}$ heat units per pound.

Ergo. $106\frac{6}{19}$° is all that could be obtained in a pail.

In the body we probably never do obtain this, because of the fact that in practice we begin with our fluid at 120° and take thirty minutes to inject it, during which time the laws of radiation are not in abeyance. We can hardly take it for granted that a bodily system which enables men to work in atmospheric temperatures of over 120° will remain inert when that same temperature is introduced into the vessels. On the contrary, with any duration of heat, not sufficient to overthrow the mechanism, would it not be quicker in its regulating action upon intravascular excess.

A perfectly healthy new-born child was placed in his crib, a hot-water bag underneath him and a bottle filled with hot water each side of his neck. This was the nurses' precaution, as the room was not very warm. She knew how efficient an ice-bag was when applied to the vessels of the neck, and she supposed heat could be utilized in the same manner with good effect. At the end of about a half-hour, on uncovering the child, I was surprised to find it breathing in a most peculiar manner similar to the Cheyne-Stokes' respiration. This soon ceased after picking up the infant, but, a few days later, I saw the same sort of dyspnœa in an older child; only here it followed a long continued poulticing of the neck. The rectal temperature was 104.2°. The poultices were discontinued, and all bad symptoms had disappeared at the time of my second visit, *i. e.* about two hours after the removal of the poultices.

One reason that such occurrences are not found frequently, is that the rubber hot-bag does not readily fit into the neck, but bottles will roll, and will stay snugly against the skin over the vessels of the neck. In my case, as the bottles formed an arch, their tops being in contact, any question of antero-posterior pressure may be dismissed. As to the temperature, I should say that any degree or amount of contact heat sufficient to keep the temperature in the carotids at 110° or over will certainly produce the disturbances described in about thirty minutes.

NOTE.—Since writing the above I have transfused two liters of decinormal salt-solution with a maximum of 120° and a minimum of 116° F. Observations of the rectal temperature during the time the solution was running into the arm showed $99\frac{1}{5}$°. Five minutes after the transfusion was completed the rectal temperature was unchanged. This demonstrates that no parallel can be drawn between the application of direct heat and heat as used in intravenous transfusion.

121 WEST EIGHTY-FIFTH STREET.

# ARTIFICIAL FLUORESCENCE OF LIVING HUMAN TISSUE.

By WILLIAM JAMES MORTON, M.D.,
NEW YORK.

As is well known, the *x* and similar radiations produce a coloration of many salts in solution. Upon this quality is based radiography. These radiations also cause certain dry crystalline and other substances to fluoresce and phosporesce. And upon this quality is based radiofluoroscopy and the fluoroscope in common use. *X* and other radiations also cause fluorescence and phosphorescence of quite a number of salts and chemical substances when these are held in solution. This latter fact may be easily demonstrated by the following simple experiment: Dissolve in a test-tube five grains of bisulphate of quinine in, say, three drachms of water. Close, for convenience, the test-tube with a cork and place it in the ordinary fluoroscope box from which the usual fluoroscopic screen has been removed and replaced by a covering of several layers of black paper. Upon now exposing the test-tube to the *x*-ray the solution of quinine will be seen to glow with a fine opalescent, bluish-purple fluorescence. The same experiment may be made with various other sustances, each affording a characteristic fluorescence.

Calculating the amount of blood in a human body to be one-thirteenth part in weight of the entire body, we may estimate that a person weighing 130 pounds will contain ten pounds of blood. This is equivalent to ten pints, or equivalent to one grain to eight ounces of water. We may, therefore, without doubt, conclude that the fluids of a person to whom twenty grains of quinine has been administered represent a solution of quinine equivalent to that above mentioned; and equally when such a person is exposed to the *x*-ray, that the person's tissue will be rendered fluorescent in the same manner.

Among fluorescent liquids, some of which may be used medically, Mr. W. J. Hammer, in a recent publication, enumerates the following: petroleum, quinine, Magdala red, eosine, uranine, saffronine, paviine, aesculine, amidophthalic acid, fluorescine, rhodamin, thalleen, resorcorufin, and resorcin blue.

In the treatment of cancer and other diseases it occurred to me that I possibly might avail myself of these facts to administer a drug medically, capable of fluorescence and at the same time establish its fluorescence in the tissues themselves by means of the *x*-ray. In the case of the quinine solution we should get the much desired violet radiation, and get it, too, in very close quarters with the tissue elements we desire to effect. A feeble fluorescence of a quinine atom lying against a tissue atom should equal in therapeutic result a much more powerful radiation from a fluorescing source much further distant. Acting upon this idea I have been in the habit, during the last year, of administering from five to ten grains or more of bisulphate of quinine about one hour before *x*-ray treatments. I cannot affirm it, for we have nothing thus far but clinical evidence to rely upon, but I believe that my cases thus treated by a combination of fluorescing medicines and the *x*-ray have made more improvement and more certain recoveries than patients not thus treated.

At all events, while all are so blindly groping in the treatment of cancer, the idea involved in the procedure I have ventured to term *x*-ray histofluorescence has seemed to me worthy of submitting to others for trial and investigation.

I have also employed this combined treatment of the *x*-ray and internal administration of fluorescing medicines to advantage, in cases of chronic malaria, Hodgkin's disease, lupus, tuberculosis, and tuberculous deposits, and, in short, whenever it is desirable to set up reparative tissue changes, important to accomplish *per se* or as resistance to bacterial and parasitic invasion. A solution of quinine may also be used hypodermically and locally if desired, or may be applied with a brush upon an exposed or denuded surface. Any portion of the human body thus artificially fluorescent may be photographed in a dark room by its own light, and I have already obtained several such photographs.

19 East Twenty-eighth Street.

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**Some Points in the Diagnosis of Gout and Some Aberrant Forms of the Disease.**—H. W. Syers says that it must be admitted that there is a use for the word "gouty" in the sense that certain symptoms depend upon the gouty constitution. It must never be forgotten that the changes external to the joint in gout may be quite as marked as, or even more so than, those which are internal to the articular cavity. It is not sufficiently recognized that the gouty process may set up an overgrowth of the bony tissue surrounding and immediately adjacent to the articular surface, while the latter is almost free from morbid change. As to latent gout, the patients who are affected in this manner are those who possess a marked gouty inheritance. Most characteristic of latent gout, though often misinterpreted, are the gastrointestinal symptoms from which this class of patients so often suffer. The most usual of these symptoms is acid dyspepsia. Great aggravation of symptoms ensues from the habit of smoking. The tendency to acidity is always accompanied with flatulence. Perhaps the most inconvenient of all these digestive troubles is a tendency to diarrhœa. It comes on at any time and is imperious. Apart from this annoyance, patients are generally quite free from any ailment whatever so long as they observe ordinary caution in regard to diet. The greatest care should be given to the diet. But no matter how much care and trouble are taken, the tendency to irregular action of the bowels will not be altogether overcome. It is an effort of nature to rid the system of noxious matters. There is no fear of an acute attack so long as this tendency to looseness of the bowels exists. The quantity and quality of nitrogenous food must be carefully regulated, but it cannot be cut off entirely. Short and repeated courses of carbonated water will often be attended with very good results.—*Treatment.*

**Hysterical Affections of the Eye.**—H. Gradle declares that with the exception of absolute hysterical blindness he has met with functional derangements attributable to hysteria so often that they constitute a notable percentage of the average practice. Of hysterical blindness, there are some fifty cases reported. The objective examination alone does not permit the distinction between hysteria and simulation. This origin may be suggested by the history. The only absolute proof of hysterical origin is the possibility of restoring the sight by psychic influence. A singular phenomenon in hysterical amblyopia has been recorded under the name "tubular field of vision." When there is a constriction of the field, the absolute area of the field is the same, no matter at what distance it is measured. The patient sees the world as if looking through a tube of infinite length. Double sight with one eye, not accounted for by optic conditions, is a symptom very suggestive of hysteria. Far more frequent than visual disturbances are pains and disagreeable sensations localized in the eyes or radiating from them into the head. But it is proven only when we succeeded in dispelling the discomfort by purely mental therapeutics—for instance, electricity. The most frequent hysterical motor phenomenon is winking. Irregular action of the ciliary muscles is an occasional manifestation of hysteria. It can usually be relieved by proper glasses, but may require some mental therapeutics.—*The Chicago Medical Recorder.*

**The Etiology of Serofibrinous Pleurisy with Reference to Cytological Diagnosis.**—C. H. Bunting says that, from his study of pleurisy cases, he does not pretend to show that all idiopathic pleurisies are tuberculous. That can be shown only by a large series of animal inoculations. These cases have, however, an exudate remarkably uniform in cellular content and general characters, which may be assumed to indicate a uniformity in the nature and etiology of the process. This uniform cellular formula, the work of others seems to indicate, is the formula of tuberculous pleurisy. Clinically considered, the cases of primary pleurisy studied may be divided into two groups: The larger group includes those which may be termed insidious pleuritis. The onset is more or less acute, but there is very little fever. The exudate is practically a chronic one when aspiration is made. The smaller group includes the cases in which the attack sets in with marked fever and such severe general symptoms that the patient is forced to take to his bed at onset. The cellular formula shows no distinction between these groups of cases. Aspiration has had no effect on the fever. The red blood count was uniformly high. A single case has come to autopsy. Tubercle bacilli had not been demonstrable in the sputum, nor had there been intrapulmonary signs. At the postmortem almost complete obliteration of both pleural cavities was found and also marked tuberculous involvement of the lungs.—*Bulletin of the Johns Hopkins Hospital.*

# MEDICAL RECORD

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